DOCUMENT RESUME

ED 363 807 CE 065 185

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TITLE What Do We Know about How Schools Affect the Labor Market Performance of Their Students?
INSTITUTION National Center on the Educational Quality of the Workforce, Philadelphia, PA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO EQW-SP-15
PUB DATE 93
CONTRACT R117Q00011-91
NOTE 55p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Academic Achievement; Educational Assessment; Educational Research; *Employment Level; *Employment Patterns; Graduate Surveys; High School Graduates; High Schools; *Job Performance; Labor Market; *Outcomes of Education; Program Effectiveness; Program Evaluation; Role of Education; *School Effectiveness; Vocational Education; Vocational Followup

ABSTRACT

Seventeen studies that linked school characteristics and labor market performance were analyzed. Each met five criteria: labor market characteristics of students after they left high school were used as output measures, quality measures of schools were identified as inputs, reasonably sophisticated statistical procedures were used, "hard" measures of labor market outcomes were used, and labor market measures after graduation were reported. Findings indicated the following: the quantity and type of vocational coursework had the most positive effect, socioeconomic status variables affected student cognitive achievement results, job experience during high school improved earnings and work stability, students' other characteristics were not significant in explaining job performance, and school location did not appear to play a role in job performance. Recommendations for increasing job performance of students who would go directly into the labor market after graduation were to focus on improvements in vocational education programs, foster job participation, and reward better teachers and schools. A longitudinal study was recommended to track the links between school characteristics and performance of students who go directly into the job market. (Two tables in the report summarize the 17 studies. Appendixes include a 23-item bibliography, a complete listing of empirical findings of school-related inputs and labor market outputs summarized in Table 1, and a detailed summary of the 17 studies and 5 others of interest summarized in Table 2.) (YLB)

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ED 363 807

What Do We Know About How Schools Affect the Labor Market Performance of Their Students?

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CE065185

"What Do We Know About How Schools Affect the Labor Market Performance of Their Students?"
EQW Catalog Number: WP15

The work reported herein was supported under the Education Research and Development Center program, agreement number R117Q00011-91, CFDA 84.117Q, as administered by the Office of Educational Research and Improvement, U.S. Department of Education. The findings and opinions expressed in this report do not reflect the position or policies of the Office of Educational Research and Improvement or the U.S. Department of Education.

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Contents

Introduction 1
Policy Significance 2
The Literature on School Characteristics and Labor Market Performance 3
Summary of Findings of the 17 Studies 5
Students' Academic Experiences 12
Students' Family Backgrounds 12
Students' Labor Market Characteristics 12
Students' Other Characteristics 12
Peer Characteristics 12
Geographic Indicators 12
School Characteristics 13
Summary of Results 13
What Do We Know? 14
What Do We Need To Know? 16
Bibliography 17
Appendix A: Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs 18
Appendix B: Detailed Summary of Relevant Studies 25

Introduction

Two recurrent themes have pervaded public opinion of education in the United States over the last 10 to 15 years: our dissatisfaction with the quality of our primary and secondary educational performance and our dissatisfaction with our economic competitiveness with respect to other countries. These two themes became tied to each other with the theory that poor educational preparation has caused us to fare poorly in global markets. But, in fact, there is no decisive evidence on that causal relation.

This paper explores the existing evidence on one aspect of the hypothesized relationship: What do we know about the effect of various characteristics of the schooling experience on the labor market performance of those schooled? In particular, we are interested in students who enter the labor force directly from high school. A substantial body of literature has been developed on the relationship between various characteristics of the school experience and cognitive achievement measures, but less literature exists on the relation between cognitive achievement in school and subsequent labor market performance. There is also a substantial body of literature on the relation between years of schooling and subsequent earnings, but there is only a sparse literature, with varied conclusions, on the linkage between what schools do and how their students then fare in the labor market. Further, almost without exception, the data in the published studies do not enable one to distinguish between the effects of schooling on high school graduates who go on to college and the effects of schooling on those who go directly into jobs. Much more attention needs to be given to the latter group.

Policy Significance

The linkage between what schools do and what their students do upon completion is important to examine. The following are some direct policy implications:

(1) Considerable educational resources are allocated toward the general objective of helping students to connect with and perform in jobs. In fact, however, we do not know whether this allocation is rational. Empirical evidence from the production function literature points to connections between the measurable characteristics of the learning process in schools and student achievement. These connections, however, can best be characterized as decisively unidentifiable. We know that certain teachers and certain schools produce consistently better results (after controlling for other facets of the students and their environment), but the specific characteristics of teachers and schools that account for the higher-than-predictable performance are not consistent.

The prevailing policy consensus among those doing research in this area is that stellar teachers and stellar schools clearly exist—and that these schools and teachers are doing things right. The evidence, however, suggests that there are innumerable ways of doing things right. Perhaps, rather than trying to structure specific techniques for a good education, those teachers and schools that are succeeding in this area, however they are doing it, should be rewarded.

It is possible, though, that direct links do exist between the measurable characteristics of the learning process and success in the labor market. Certainly, the extensive discussions of curriculum content, performance measures, disciplinary requirements, and counseling methods are based on the notion that there are methods schools can use to enhance their students' future employment patterns. If these direct links exist, we need to identify them and to direct resources toward them, so that labor force participation rates and job performance for those going directly to jobs from high school are increased.

(2) Even if direct links between school programs and the labor market experiences of their graduates are not identifiable, it may still be true that schools make a significant difference—but not in a uniform way. Or, it may be that the home environment dominates the results. How our government allocates its educational dollars, and how it allocates resources between welfare assistance and education should be influenced by the findings.

Although the relation between years of schooling and subsequent earnings is identifiable, the measures are blunt. We do not know whether there is a substantive connection or only a credentialing connection. For example, if you learn four more years of math, is your marginal product worth $X more to employers? If you have two years of vocational education in an area in which you are subsequently employed, do you receive higher wages than the person who had the same number of years of education, but no vocational education? If you are in smaller classes, do you have a learning climate that nurtures you in a way that makes your worth to employers greater than someone with the same school and family characteristics who was educated in a large class?

We need to know whether there are identifiable forms of restructuring schooling that will change labor market returns or whether it is the family environment, and/or nonidentifiable factors, that account for larger earnings. It is possible that some schools and some teachers excel in providing the motivation and skills for good job performance; but, as is the case in affecting cognitive achievement, there are any number of ways of providing the stimulus. If there are identifiable characteristics, we would want to have policies that direct resources to them. If they are not identifiable, but

schools do produce different labor market outcomes, we would want to focus policy on directing resources to provide incentives for teachers and schools to motivate students for labor market performance—leaving it to the teachers and principals to figure out how to do so. If the home environment dominates the outcomes, then schools may not be the arena to focus on to improve job performance.

(3) The appropriate role for the federal government in the delivery of education—constitutionally determined as primarily the role of state and local governments—is critically dependent on establishing more clearly the magnitude of the national public good derived from changes in school characteristics. For example, the case for federal investment in science laboratory equipment in high schools rests on the evidence that such investment will yield a return to the nation in the form of higher productivity. If the return is only to the individual's earnings, there is little case for tampering with the current federal allocation of educational responsibilities, except for the redistributional effects of educational resources targeted to low-income students.

The empirical evidence on the connections between national measures of productivity changes and educational attainment does not match the national rhetoric on the subject. Former Vice President Quayle's National Council on Competitiveness focused, almost exclusively, on the role of education in changing America's competitive position vis-à-vis the rest of the world. John W. Kendrick (1977) and Jong-Il Kim and Laurence J. Lau (1992), using more elegant econometric techniques, converge on the general conclusion that educational attainment explains about 10 percent of the changes in productivity in the United States. Only limited information is gained from these studies on the role of schools, because the investigators use years of schooling as the education measure, not school quality indicators. Eric A. Hanuschek and colleagues sum up their review of the evidence: "The message from consideration of growth and productivity is that, even though a linkage with school quality seems plausible, the case is not fully made" (1992, 6).

The ability and capacity of America's elementary and secondary schools to deliver entrants into the labor market who have the skills employers want to reward, so that individual and aggregate national productivity can be enhanced, is important to assess. If resources are to be allocated efficiently within education budgets, and between education and welfare budgets, identifying the link between what schools do and how their students perform in the labor market is essential.

The Literature on School Characteristics and Labor Market Performance

We conducted a thorough search of the empirical literature and identified over 200 studies that linked school characteristics and labor market performance. Twenty-two of these studies met the following criteria:

(1) The labor market characteristics of students after they left high school were used as output measures.

(2) Quality measures of schools were identified as inputs.

(3) Reasonably sophisticated statistical procedures were used, such as multiple regression analysis, large sample size, and a range of control measures.

Two additional criteria were imposed that reduced the number of studies analyzed to 17:

(4) The studies used "hard" measures of labor market outcomes, such as annual earnings, weekly earnings, hourly

earnings, number of weeks per year employed, number of months per year unemployed, return to education, and the Duncan Index of Occupational Status (Duncan 1961). The studies that used "soft" survey instruments, such as educational expectations, occupational expectations, and self-esteem, were excluded from the analysis, but summaries of these studies are reported in Appendix B.

(5) The studies reported on labor market measures after graduation and not job characteristics of students while still in school.

Table I presents a summary of the 17 directly relevant studies. It contains succinct summaries of the level of aggregation of the data, the dating of those data, the characteristics of the sample studies, the nature of the school input measures used, the characteristics of the measurements of the pupil, the peer input variables used, the labor market output measures examined, and the inputs with coefficients that had statistically significant results. Appendix B includes a more detailed set of summaries for each of the 17 studies analyzed and for the 5 studies (B-5, H-1, H-2, H-3, H-4) that were of particular interest, but that had either soft output measures or focused on students still in school, or both.

Several observations can be made about these studies:

(1) A substantial number of the observations of labor market outcomes were taken a year or two after graduation from high school. Most were taken less than six years after, although some samples were taken a decade or more after graduation.

(2) None of the studies had school organization measures as one of the school inputs. It was not possible, therefore, to get any reading on the impact of variations across school districts on such characteristics as the degree of discretionary control of the school principal, the use of dollar incentives to reward principal or teacher performance, and the stringency of state regulations on educational curriculum and licensing. Although these are areas of great interest now, these studies provide no guidance about their impact on the subsequent labor market performance of students.

(3) It was not possible, in aggregating the results of all these studies, to distinguish the findings for students who went on to college from those for students who went directly into the job market from high school. The level of detail of the statistical results presented in the studies was not sufficient to allow us to disentangle the two groups.

(4) Not one of these studies was based on an individual-specific longitudinal study of the quality that has existed for some time in the study of cancer and heart disease. Not one tracked individual pupils through several years of schooling and then tracked them individually through year after year of job experience. The labor market outcomes in relation to student, peer group, and school characteristics revealed in the 17 studies analyzed are interesting, but the short time periods, and the aggregation within the samples of students out of school for varying numbers of years, do not allow any satisfactory controls on the effects of life-cycle earnings patterns.

The net result of these observations is that we are limited in our ability to draw policy implications from the analysis of the 17 studies, even when they appear to show some convergence.

Summary of Findings of the 17 Studies

What can we learn from the more systematic and rigorous studies done on the relation between school characteristics and the employment characteristics of their students?

Tables I and II present a compressed version of the answer to this question. The 17 studies summarized in Table I (and more fully in Appendix B) all presented empirical estimates of the marginal effects of a wide range of inputs on one or more of these labor market outputs:

- annual earnings
- weekly earnings
- hourly earnings
- number of weeks per year employed
- number of months per year unemployed
- return to education
- occupational attainment

The large number of inputs, differently defined for different studies, were grouped in Table II into seven categories of interest:

- students' academic experiences
- students' family backgrounds
- students' labor market characteristics
- students' other characteristics
- peer characteristics
- geographic indicators
- school characteristics

There was a further grouping of inputs under each of these general categories. The results in the first and last categories, students' academic experiences and school characteristics, are of greatest interest in this paper. Not all the findings of all 17 studies are summarized in the table. Many of the studies had control variables that were not included. For example, the industry in which the student became employed was used as a control in some studies for wage differences associated with such factors as unionization. Since the focus of this paper is on schooling, this information is not reported in the table. Appendix A provides a complete listing of the data entered into Table II. For each study and each relevant input, Appendix A provides the following information:

- the code number of the study
- the specific labor market output measure used
- the impact of the specific input—statistically significant positive (+), statistically significant negative (-), or not statistically significant (NS)
- the general category of input
- the number of years the student had been out of high school
- the description of the population

We reversed the sign on all the unemployment output measures to enable all positives to be interpreted as "good" and all negatives as "bad."

Table II lists the general and specific input categories in the first column. The number of studies that had findings in each of the general categories is also listed in the first column. There are many more findings than studies because, in many cases, several measures of the inputs and outputs were used in one study. All the relevant findings are reported in the table. The number of coefficients that were positive and statistically significant for each input are in the second column, the number that are statistically significant and negative are in the third column, and the total number of statistically significant findings are in the fourth column. Nonsignificant findings are summarized in the fifth column, and the total number of findings for each input are in the last column.

What do we know about schooling and labor market performance from these 311 findings?

Table 1: Summary of Relevant Studies

STUDY REF # AND AUTHOR	LEVEL OF DATA	SAMPLE: year(s)	#	sex	other	INPUTS: school	pupil	peer
B-1: Benson et al	Individual	1972 1986 1980	23,000 5,000 58,000	M,F M M,F	HS seniors Ages 14-24 HS sophomores and seniors	curriculum variables	individual characteristics academic performance variables	
B-2: Bishop et al	Individual	1980, 1982 1972, 1973	28,000 22,852	M,F M,F	HS seniors and 2 years later HS seniors and 1 year later No full-time college or active military service in either case	2 school features 2 curriculum variables	6 SES variables 10 academic performance variables 12 individual characteristics 2 employment variables	
B-3: Bishop	Individual	1971	1,774	M	Household heads, ages 25-64		2 academic performance variables 1 individual characteristic	
B-4: Bishop	Individual	1980, 1982	3,000	M,F	HS seniors and 2 years later, no full-time college	2 curriculum variables	6 SES variables 4 individual characteristics	
C-1: Card and Krueger	Individual, with state level aggregations	1979	279,008 299,063 441,675	M M M	White, born between 1920-1929 White, born between 1930-1939 White, born between 1940-1949 No schooling restrictions in all cases	3 school quality variables 2 teacher characteristics	1 academic performance variable 7 individual characteristics 1 employment variable	6 peer variables
G-1: Griffin and Alexander	Individual, with some school level aggregations	1955, 1970	338	M	Terminal HS graduates	2 curriculum variables 1 school quality variable school dummy variables	7 SES variables 4 academic performance variables 1 employment variable	1 peer variable
G-2: Gustman and Steinmeier	Individual, with race and gender aggregation	1972 1976	167 2,405	M,F M,F	Black and white, age 21 Black and white, age 22 Terminal HS graduates in both cases	11 curriculum variables	1 SES variable 4 individual characteristics	

LABOR MARKET OUTPUT MEASURE	YRS. OUT OF HS	FINDINGS effect	specific input	population*
Earnings: Annual	1	+	Vocational Education	All Females, Black Females, White Females, All Males, White Males
Earnings: Annual	1	+	Family Income	NLS Males, HSB Males, NLS Females, HSB Females
		+	GPA	NLS Males, HSB Females
		+	Job In HS	NLS Males, HSB Males, HSB Females
		+	School Location: North Central	NLS Males
		+	School Location: Northeast	NLS Females, NLS Males, (HSB Females: New England)
		+	School Location: Pacific Region	HSB Females
		+	School Location: South	NLS Females
		+	School Location: South Atlantic	HSB Females
		+	School Location: West North Central	HSB Females
		+	School Location: West South Central	HSB Females
		+	School Location: Rural	HSB Males, NLS Females
		+	School Location: Suburban	HSB Females, HSB Males
		+	Vocational Courses: More Semesters Of	HSB Males
		-	Academic Courses: # Of Semesters	HSB Females
		-	School Location: East North Central	HSB Males
		-	School Location: New England	HSB Males
		-	School Location: Pacific Region	HSB Males
		-	School Location: South Atlantic	HSB Males
		-	School Location: Rural	HSB Females
		-	Studying: Hours Spent	NLS Males
Earnings: Hourly	1-3	+	Family Income	HSB Males, NLS Females
		+	GPA	HSB Females
		+	Job In HS	HSB Males, HSB Females
		+	Vocational Courses: More Semesters Of	NLS Females, HSB Males, HSB Females
		-	Academic Courses: # Of Semesters	NLS Females
Employment: # Of Months Unemployed	1	+	Academic Courses: # Of Semesters	HSB Females
		+	Studying: Hours Spent	HSB Males
		-	GPA	NLS Females, HSB Females
		-	Job In HS	NLS Males, NLS Females, HSB Males, HSB Females
		-	Vocational Courses: More Semesters Of	HSB Males, HSB Females
Earnings: Weekly	7-46	+	Ability: Gains In General Intellectual Ability	Male Household Heads
Earnings: Annual	1	+	Vocational Courses: 4 courses	Males, Females
Earnings: Hourly	1	+	Vocational Courses: 4 courses	Males
Worked: % Of Months	1-75	+	Vocational Courses: 4 courses	Females
Earnings: Weekly	21-41	+	Ratio Of Pupils To Teachers: Decrease In	White Males
		+	School Quality	White Males
		+	Teacher Salaries	White Males
		+	Teachers: Better Educated	White Males
Earnings: Annual	12	+	Occupational Attainment	Males
		+	Teacher Contact	Males
		-	College Track	Males
Occupational Attainment	13	+	Academic: Math And Science Coursework	Males
		+	Job Aspirations: White Collar	Males
Earnings: Weekly	3-4	+	Vocational: Business Commercial Courses	White Females
Employed Weeks	2-3	+	Vocational: Business Commercial Courses	White Females (NLS72 only)
		-	Vocational Program: Health Fields	White Males (NLS72 only)

** Certain studies disaggregated their findings according to the survey used. In these cases, the population description indicates this distinction. HSB refers to findings of the High School and Beyond survey; NLS refers to findings of the National Longitudinal Survey of the Class of '72. SES refers to socioeconomic status; ADA refers to average daily attendance.* Table 1 (cont.): Summary of Relevant Studies

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STUDY REF # AND AUTHOR	LEVEL OF DATA	SAMPLE: year(s)	#	sex	other	INPUTS: school	pupil	peer
J-1: Johnson and Stafford	Individual	1965	1,039	M	White, with some income in 1964	state expenditure figures	2 SES variables 4 individual characteristics 1 academic performance variable 1 employment variable	
K-1: Kohen	Individual School	1966 1968	1,321	M	Black and white, ages 18-24 in 1966, out of school 3,030 schools	school quality index district expenditure figures	2 individual characteristics 2 academic performance variables 1 SES variable 1 SES index (5 inputs)	
L-1: Link and Ratledge	Individual	1968	214 945	M M	Black, ages 16-26 White, ages 16-26 Out of school at least 1 year in both cases	district expenditure figures	2 individual characteristics 2 academic performance variables 2 employment variables	
M-1: Meyer and Wise	Individual	1972, 73, 74, 76	22,652	M	HS seniors and 1-4 years later White and non-white, some enrolled in college	job training in school	3 individual characteristics 6 SES variables 3 academic performance indicators 4 employment variables	2 employment variables
M-2: Morgan and Sirageldin	Individual	1965	1,525	M,F	Household heads with income in 1964	state expenditure figures	4 individual characteristics 1 academic performance variable	1 demographic variable
O-1: O'Neill	Individual	1980, 1987	902 2,055	M M	Black, ages 22-29 in 1987 White, ages 22-29 in 1987 All worked at least 35 hrs/wk	2 school characteristics school quality individual test scores used as proxy measure	1 individual characteristic 4 academic performance variables 2 SES variables 5 employment variables	2 regional variables
P-1: Parnes and Kohen	Individual, school	1966, 1968	1,500 3,500	M M	Black, ages 14-24 in 1966 White, ages 14-24 in 1966	school quality index (4 inputs) 1 school resource variable	4 individual characteristics 2 academic performance indicators 5 SES variables 2 employment variables	
R-1: Rumberger and Daymont	Individual	1979, 1980	1,857	M,F	Ages 17-21 in 1979 No full-time school enrollment	3 curriculum variables	5 individual variables 1 academic performance indicator 3 SES variables	
W-1: Wachtel	Individual, school	1969	1,812	M	In the Army in 1943, mean age in 1969 was 47 Respondents attended public schools only	district expenditure figures 7 school quality measures	1 individual characteristic 2 academic performance indicators 4 SES variables	1 economic variable
W-2: Welch	State, aggregated from individual and school	1959		M	Rural farm males, at least 25 years old No college attendance	4 school quality variables	2 individual characteristics 1 academic performance indicator 1 SES variable	6 variables

LABOR MARKET OUTPUT MEASURE	YRS. OUT OF HS	FINDINGS effect	specific input	population*
Earnings Hourly	1-24+	+	Expenditures: State Total Per ADA**	White Males Who Are Household Heads
Earnings Hourly	1-6	+	Education: Years Of Education	Black Males, White Males
Occupational Attainment	1-6	+	Education: Years Of Education	White Males
		+	School Quality	White Males
Earnings Annual	1-10	0	Ability	Black Males, Whites Males
		+	Education: Years Of Education	Whites Males
		+	Expenditures: District Total Per ADA**	Black Males, White Males
Earnings Hourly	1-4	0	Class Rank	Males
		+	Family Income	Males
		+	Job Training (significant in 5th year only)	Males
		+	Job: Hours Worked While In High School	Males
		+	Test Scores	Males
Employed Weeks	1-4	0	Class Rank	Males
		+	Job: Hours Worked While In High School	Males
		+	Test Scores, But Effect Diminishes Over 4 Years	Males
Earnings Hourly	1-24+	0	Expenditures: State Total Per ADA**	Male And Female Household Heads
Earnings Hourly	4-11	+	Test Scores	Black Males, White Males
Earnings Hourly	0-10	+	Occupational Information Test Score	Black Males, White Males
Earnings Hourly	1-7	0	Vocational And Academic: Amount Of Coursework	Females
		+	Vocational Program Later Used On A Job	Females
Employment: # Of Weeks Unemployed	1-6	0	Vocational And Academic: Amount Of Coursework	Males, Females
		0	Vocational Program	Males, Females
		+	Vocational Program Later Used On A Job	Males, Females
Worked: # Of Hours	1-6	0	Vocational And Academic: Amount Of Coursework	Males, Females
		0	Vocational Program	Males, Females
		+	Vocational Program Later Used On A Job	Males, Females
Earnings Annual	≥26	+	% Of HS Graduating Class Who Received PhDs	Males, In The Army In 1943
		+	Average Enrollment Per Building	Males, In The Army In 1943
		+	Expenditures: District Instructional per ADA**	Males, In The Army In 1943
		+	Expenditures: District Total Per ADA**	Males, In The Army In 1943
		+	Length Of School Year	Males, In The Army In 1943
		+	Percentage Of Teachers With MA Or Phd	Males, In The Army In 1943
		+	Ratio: Ave. Teacher Salary To State Median Income	Males, In The Army In 1943
		+	School Size: Of High School Graduating Class	Males, In The Army In 1943
		+	Teachers: Average Salary	Males, In The Army In 1943
Education: Return To	≥7	+	Teacher Salaries	Males Who Live On Farms
			Ratio Of Teachers To Pupils	Males Who Live On Farms

** Certain studies disaggregated their findings according to the survey used. In these cases, the population description indicates this distinction. HSB refers to findings of the High School and Beyond survey. NLS refers to findings of the National Longitudinal Survey of the Class of '72. SES refers to socioeconomic status. ADA refers to average daily attendance.*

***average daily attendance*

Table II:

Summary of Empirical Findings in 17 Studies of Schooling-Related Inputs and Labor Market Outputs

	# of Statistically Significant Findings			# of Nonsignificant Findings	Total # of Findings
	+	−	Total		
Students' Academic Experience (11 studies)					
High school degree	0	0	0	3	3
Hours of studying	1	1	2	3	5
Test scores/rank	7	1	8	14	22
Type and quantity of vocational coursework	16	2	18	32	50
Type and quantity of academic coursework	2	3	5	11	16
Years of education	4	0	4	5	9
Total	30	7	37	68	105
Students' Family Background (7 studies)					
Family income/possessions	3	0	3	6	9
General socioeconomic status	0	0	0	9	9
Parental education and occupation	0	0	0	14	14
Number of siblings	0	0	0	8	8
Race	0	0	0	8	8
Total	3	0	3	45	48
Students' Labor Market Characteristics (4 studies)					
Worked during high school	6	1	7	3	10
Part-time student	0	0	0	3	3
Occupational information/aspirations	2	0	2	1	3
Total	8	1	9	7	16
Students' Other Characteristics (6 studies)					
Ability	3	0	3	7	10
Self-scoring results	0	0	0	18	18
Miscellaneous other	0	0	0	17	17
Total	3	0	3	42	45

Table II (cont'd):
Summary of Empirical Findings in 17 Studies of Schooling-Related Inputs and Labor Market Outputs

	# of Statistically Significant Findings			# of Nonsignificant Findings	Total # of Findings
	+	−	Total		
Peer Characteristics (3 studies)	1	0	1	6	7
Geographic Indicators (4 studies)					
Central states	3	1	4	14	18
Northeast	1	1	2	2	4
Mountain	0	0	0	3	3
Pacific coast	1	1	2	2	4
South	2	2	4	5	9
Rural	1	1	2	4	6
Suburban	1	0	1	3	4
Urban	1	0	1	3	4
Total	10	6	16	36	52
School Characteristics (11 studies)					
Length of year/term	1	0	1	1	2
Teacher/pupil contact	2	1	3	2	5
Quality of teachers	2	0	2	1	3
School size	2	0	2	0	2
District/state ADA* $ or Teacher Salaries	9	0	9	0	9
Other characteristics	1	1	2	15	17
Total	17	2	19	19	38

** average daily attendance.*

Students' Academic Experiences

For each input in this category, the number of nonsignificant findings is larger than the number of significant findings. Among the significant findings, the quantity and type of vocational coursework stands out as having the most robustly positive effect. A substantial number of studies looked at this factor with a substantial number of measures—50 findings in all. Twice as many showed no effect as showed significant positive effects, but, given the great variation in the studies, 16 positive findings is not a result to ignore. The type and quantity of the academic curriculum does not appear to have any definable impact on students entering the labor market. Among the significant findings, measured performance in high school and the number of years of education have positive effects, although, in both cases, there is a large number of nonsignificant findings.

Students' Family Backgrounds

Only 7 of the 17 studies used one or another of students' family background characteristics as a control variable. One very robust finding from the large number of education production function studies is that socioeconomic status (SES) variables affect student cognitive achievement results. Yet, in the seven studies that considered the impact of family background on job performance, there were essentially no discernible effects. Family income did show up positively, however, in one-third of the results that examined the impact. Presumably, the authors of the 10 studies that did not consider the impact of SES hypothesized that there were no important effects. On the basis of the available evidence, the conclusion would appear to be that SES factors have a strong effect on school performance, but the effects dissipate once the graduate enters the labor market. There was no discernible pattern in the measured effects of SES on job performance associated with the inclusion or exclusion of school cognitive performance as a control variable.

Students' Labor Market Characteristics

For students who plan to go directly into the labor market after graduation, many programs across the country involve some job market *experience during high school. Only four of* the studies incorporated this factor into their empirical analysis, so there is not much information to be gleaned. The only finding that stands out here is that job experience during high school improves earnings and work stability after high school.

Students' Other Characteristics

Six of the studies, using 45 different measures, looked at the effects of some measures of general ability, some self-scoring attributes, and a range of characteristics such as marital status, number of children, and health. Essentially, these turned out not to be significant in explaining job performance, although there is some suggestion that those with higher IQs (or other ability measures) fared better in their employment. Even here, the number of nonsignificant results was more than twice that of significant results.

Peer Characteristics

Only three studies used peer characteristic variables, although this is a major path of inquiry for those examining the impact of schools on student achievement. No guiding results emerged.

Geographic Indicators

Neither the regional locations of schools, nor whether they were located in rural, suburban, or urban settings, appeared to play an identifiable role in the job performance of students. The location dummy variables can be interpreted as incorporating at least two factors: (1) the geographic indicators could capture the state of the economy of the regions—that is, the relative unemployment rate in the industries that high school graduates enter; or (2) the indica-

tors could capture something about the relative quality of the region's schools not otherwise taken into account. If these two factors were independent, or counteracting in influence, not much could be learned from the coefficients of the geographic indicators. There is some reason to hypothesize, however, that these two factors are reinforcing. Areas with relatively high unemployment rates are likely to have relatively low tax bases and, therefore, are likely to spend less on schools. They are likely to have a less well-educated population, which may translate into a less motivated peer group. If this is so, then the absence of decisive locational impacts on labor market experience probably means that geographic differences in schools and labor markets —at least at the gross level of geographic location examined--do not play an important role in how high school graduates fare in their jobs.

School Characteristics

Although most studies included some school characteristics in their analysis, six did not even consider this factor, presumably hypothesizing that there was no theoretical argument for the relation between measurable characteristics of school and job performance of graduates. Yet, the American public is increasingly vocal about the need for structural school reforms to improve individual and aggregate productivity.

Summary of Results

On the basis of a sparse set of findings, the results appear to be the following:

(1) The length of the school year or term, the amount of teacher-pupil contact (class size is one of the measures in this category), and a wide range of characteristics of schools (such as composite quality indices and whether the school has a work-cooperative arrangement) do not affect the job experiences of graduates.

(2) The two significantly positive coefficients describing the quality of teachers were descriptive of their education—better-educated teachers produce more effective employees—but there are only two results to draw on (studies C-1 and W-1).

(3) Larger schools produce students with more effective job performance, according to two findings—one using enrollment number, one using capacity numbers—from one study (W-1). Perhaps this is attributable to the wider curriculum range of larger schools; perhaps it is attributable to the advantage students have in experiencing the more complex social interrelationships of larger institutions; or perhaps both influences are at work. Again, there are only two results to draw on, both from the same study.

(4) Two studies (L-1, W-1) examined the effects of district-level total expenditures per average daily attendance (ADA) on annual earnings, and two (J-1, M-2) examined the effects of state-level total expenditures per ADA on hourly earnings. All four showed significant positive results, and all four examined the earnings effects many years after graduation. The extensive longitudinal coverage encourages one to take these findings seriously, but the level of aggregation of the state data reduces their importance. There are enormous disparities among school expenditures within states. Indeed, these intrastate disparities produce the continuous flow of state school finance litigation. Not matching district level expenditures to the data on schools and pupils reduces, and perhaps eliminates, confidence in the results.

(5) Perhaps the most interesting result is that there is a finding to be pursued further in the existing, although sparse, evidence on the effects of instructional expenditures on the labor market performance of those taught. One study (W-1) used three different measures of instructional expenditures to measure the effects, 26 years later, on the earnings of males who were in the Army in 1943—district level instructional expenditures per ADA, district level ratio

of teacher salaries to their state's median income, and average teacher salary in the school district. In all three cases, the effects were positive and significant. Another study (C-1) found a positive and significant effect of average teacher salaries in the school (normalized by average wages in the state and by national wages in that year) on the weekly earnings of white males two to four decades after graduation. Still another study (W-2) of males who live on farms found a positive and significant effect of average salaries in the school district on the return to education seven or more years after graduation.

The findings on school characteristics suggest that better teachers produce better employees; that is, better-educated teachers produce better labor market results for their students, as do better-paid teachers.

What Do We Know?

As evidence on the relative decline in American industrial productivity and the relatively low performance of our students mounts, two interrelated, stormy debates are escalating in intensity. The ability to affect student performance through fundamentally restructuring the organization of primary and secondary schooling is one major area of debate and reform; another is the ability of these schools to deliver entrants into the labor market who have the skills employers want to reward, because they translate into higher productivity. What is missing from the policy arena is the documentation, with empirical evidence, of the links between what schools do and how their students perform in the labor market. Our review of the literature indicates that we know very little about this, although there are some suggestive leads.

No study that we have identified has a set of characteristics that meets reasonable research standards for drawing policy inferences on the question of what schools can do to improve the labor market performance of their graduates. The combined wisdom of the best of the existing studies is that, for most categories of the inputs identified as relevant to future job performance, there were far more nonsignificant results than significant ones, and the story was frequently mixed between positive and negative results among the statistically significant results.

Some findings, however, are suggestive, indicating what type of data should receive particular emphasis if and when a proper empirical study is mounted:

- The type and quantity of vocational education, among the statistically significant findings, stands out as having the largest number of positive results. There were more nonsignificant results than significant ones, but the substantial number of positive results suggests the desirability of identifying the common characteristics of effective vocational education programs.
- On the other hand, the type and quantity of academic programs does not appear to have any consistent impact on the labor market performance of those who enter the labor market directly after high school.
- Acquiring knowledge about working during the high school years—through direct job experience or other sources of information—appears to be helpful for future job performance.
- There is some suggestion that larger schools provide a better preparation for the job market, but this theory was barely studied in the research.
- There is a strong suggestion that better teachers do a better job of preparing students for the world of work.

Table III

Summary of Limitations of Relevant Studies

Study Ref #	Data Source	Labor Market Output	Yrs Out	School Inputs	Limitations
B-1	NLS, NLS-LME, HSB	earnings	1	curriculum	limited school inputs
B-2	HSB, NLS72	earnings, months worked	0-1.25	curriculum, geographic indicators	limited school inputs
B-3	PSID, test scores, CPS	earnings	7-46	none	no school inputs
B-4	HSB	earnings, wage, months worked	1-1.8	curriculum	limited school inputs
B-5	HSB	occupational expectations, work values	0	full range	0 years out; soft output measure
C-1	multiple sources	earnings	21-41	ratio, days, pay, teacher years of education	state level aggregation
G-1	ETS survey	occupational attainment, earnings	12, 13	curriculum, school dummy, personnel influence	limited school inputs
G-2	Parnes, NLS72	earnings, employment	1-4	curriculum	limited school inputs, 1-4 yrs. out
H-1	HSB	expectations, self-esteem, etc.	0	dummy variables	0 years out; soft output measure
H-2	HSB	expectations, self-esteem, etc.	0	full range	0 years out; soft output measure
H-3	HSB	expectations, self-esteem, etc.	0	curriculum	0 years out; soft output measure
H-4	HSB	hours worked, wages, labor force status	0	full range	0 years out
J-1	Survey Research Center	earnings	1-24+	expenditures	state level aggregation
K-1	NL Surveys Project	earnings, unemployment, occupational status	1-6	quality index, district expenditures	district level aggregation; not controlled for no. of years out
L-1	NLS of the Labor Force	earnings	1-10	district expenditures	district level aggregation
M-1	NLS72	weeks worked, wages	4-5	job training in HS	limited school inputs
M-2	Interviews	earnings	1-24+	expenditures	state level aggregation
O-1	NLSY	wage	4-11	AFQT* score, ratio, degrees	questionable "quality" measure (AFQT score)
P-1	NL Surveys Project	occupational assignment and information, wage	0-10	quality index, counselors per pupil	not controlled for no. of years out
R-1	NLS-LME	earnings, unemployment, hours worked	1-7	curriculum	limited school inputs
W-1	NBER-TH	earnings	≥26	expenditures, full range of district measures	district level aggregation
W-2	Biennial Survey	return to education	≥7	expenditures, ratio, salary, enrollment	state level aggregation

For a full description of the data sources, please refer to Appendix B.
** Armed Forces Qualification Test.*

Education measurements and salary measurements appear to support this.

- One study (G-1) examined the effects of schools on annual earnings 12 years after high school graduation, using dummy variables for individual schools, and concluded that over 15% of the variance in earnings is accounted for by secondary school differences. Differences among schools, not identifiable by individual characteristics, matter; and the collected results of the studies examined indicate that SES characteristics do not dominate the job outcomes.

If a policy maker were compelled to produce recommendations now for increasing the job performance of the high school students who were going directly into the labor market after graduation, the recommendations would likely be the following:

- Make clear that schools can have a significant effect on their students' job futures. Home environment effects do not preclude positive effects from better schools.
- Focus on improvements in vocational education programs rather than on academic curriculum.
- Foster actual job participation and provide extensive job information for students while they are in school.
- Reward better teachers and better schools.

The need to produce immediate recommendations should not interfere with the development of a well-designed research plan that could guide secondary schools in the preparation of their students for the job market on the basis of better-grounded analysis.

What Do We Need To Know?

If the fundamental changes being implemented in some of the nation's schools are not informed by the evidence we can gather, we will waste many resources on reform without accomplishment. In many ways, there is a remarkable consensus among educators, policy makers, and the public in the United States. On the whole, we agree that our schools are producing students whose skills are much lower than they could be; and, on the whole, we agree that the productivity performance of our labor force handicaps us in international trade. We must understand what schools *can* do to improve the abilities of their students to function in the labor market.

The emphasis on cognitive scores as the output measure of schools has resulted in fusing the analysis of school effects on students who go on to higher education with their effects on students who go directly into the job market. The literature on the economic returns to schooling has contributed to this emphasis on higher education. Perhaps the most important way we can reduce the disparities in unemployment rates among different groups in the labor force and improve our productivity is by focusing more on those who do not go on to college. We have little orderly information on this group of students and on what schools do and can do for them.

Table III lists the studies surveyed in this paper and their limitations for analyzing the effects of schools on the labor market experiences of high school graduates. Some combination of the following characteristics describes the studies: they measure no school inputs or a limited number of school inputs; they measure wages or earnings or other labor market measures within a short time after graduation; they measure inputs at the school district or state level of aggregation.

Basic data for addressing all these limitations are available in the High School and Beyond (HSB) data base (from the U.S. Department of Education's National Center for Education Statistics). It is now feasible to mount a longitudinal study that can track the links between school characteristics and the performance of students who go directly into the job market. Such a study can examine these links for high school graduates up to four years out of school as well as set up the model for examining these students 10 years after graduation, when those data are available. More specifically, the HSB data base can track students who were high school sophomores in 1980 to when they were seniors in 1982, providing two years of information on school performances, school characteristics, curriculum detail, teacher characteristics, and student job experiences. These students can then be tracked to their job experience two years after leaving school (1984) and four years after (1986). It is fully feasible to examine whether high schools make a difference in the labor market performance of their students and, if they do, whether the differences are systematic. Within a year, the 1992 job information on these students will be available. It will then be possible to address the question of school effects more firmly. Are there long-term effects that are not visible in the vagaries of the first few years of job experience? Are the effects that were discernible in the first few years the same ones that are discernible 10 years after leaving high school?

Discussions of school restructuring have focused heavily on cognitive achievement. This is, of course, an appropriate measure of the value added of schools, particularly for those students going on to higher education. But, there is another appropriate measure not clearly correlated with cognitive achievement—the labor market performance of the graduates who do not go on to college. This is a much-neglected group and may well be the most important one in the nation's review of its productivity concerns.

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Appendix A: Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
B-2	Students Academic Experience	Academic Courses: # Of Semesters	+	Employment: # Of Months Unemployed	1	HSB* Females
G-1	Students Academic Experience	Academic: Math And Science Coursework	+	Occupational Attainment	13	Males
M-1	Students Academic Experience	Class Rank	+	Earnings: Hourly	1-4	Males
M-1	Students Academic Experience	Class Rank	+	Employed Weeks	1-4	Males
L-1	Students Academic Experience	Education: Years Of Education	+	Earnings: Annual	1-10	Whites Males
K-1	Students Academic Experience	Education: Years Of Education	+	Earnings: Hourly	1-6	Black Males, White Males
K-1	Students Academic Experience	Education: Years Of Education	+	Occupational Attainment	1-6	White Males
P-1	Students Academic Experience	Education: Years Of Education	+	Earnings: Hourly	0-10	Black Males, White Males
B-2	Students Academic Experience	GPA	+	Earnings: Annual	1	NLS** Males, HSB Females
B-2	Students Academic Experience	GPA	+	Earnings: Hourly	1-3	HSB Females
B-2	Students Academic Experience	Studying: Hours Spent	+	Employment: # Of Months Unemployed	1	HSB Males
M-1	Students Academic Experience	Test Scores	+	Earnings: Hourly	1-4	Males
O-1	Students Academic Experience	Test Scores	+	Earnings: Hourly	4-11	Black Males, White Males
M-1	Students Academic Experience	Test Scores, But Effect Diminishes Over 4 Years	+	Employed Weeks	1-4	Males
R-1	Students Academic Experience	Vocational And Academic: Amount Of Coursework	+	Earnings: Hourly	1-7	Females
R-1	Students Academic Experience	Vocational And Academic: Amount Of Coursework	+	Employment: # Of Weeks Unemployed	1-6	Males, Females
R-1	Students Academic Experience	Vocational And Academic: Amount Of Coursework	+	Worked: # Of Hours	1-6	Males, Females
B-4	Students Academic Experience	Vocational Courses: 4 courses	+	Earnings: Annual	1	Males, Females
B-4	Students Academic Experience	Vocational Courses: 4 courses	+	Earnings: Hourly	1	Males
B-4	Students Academic Experience	Vocational Courses: 4 courses	+	Worked: % Of Months	1.75	Females
B-2	Students Academic Experience	Vocational Courses: More Semesters Of	+	Earnings: Annual	1	HSB Males
B-2	Students Academic Experience	Vocational Courses: More Semesters Of	+	Earnings: Hourly	1-3	NLS Females, HSB Males, HSB Females
B-1	Students Academic Experience	Vocational Education	+	Earnings: Annual	1	All Females, Black Females, White Females, All Males, White Males
R-1	Students Academic Experience	Vocational Program	+	Employment: # Of Weeks Unemployed	1-6	Males, Females
R-1	Students Academic Experience	Vocational Program	+	Worked: # Of Hours	1-6	Males, Females
R-1	Students Academic Experience	Vocational Program Later Used On A Job	+	Earnings: Hourly	1-7	Females
R-1	Students Academic Experience	Vocational Program Later Used On A Job	+	Employment: # Of Weeks Unemployed	1-6	Males, Females
R-1	Students Academic Experience	Vocational Program Later Used On A Job	+	Worked: # Of Hours	1-6	Males, Females
G-2	Students Academic Experience	Vocational: Business Commercial Courses	+	Earnings: Weekly	3-4	White Females
G-2	Students Academic Experience	Vocational: Business Commercial Courses	+	Employed Weeks	2-3	White Females (NLS only)
B-2	Students Academic Experience	Academic Courses: # Of Semesters	-	Earnings: Annual	1	HSB Females
B-2	Students Academic Experience	Academic Courses: # Of Semesters	-	Earnings: Hourly	1-3	NLS Females
G-1	Students Academic Experience	College Track	-	Earnings: Annual	12	Males
B-2	Students Academic Experience	GPA	-	Employment: # Of Months Unemployed	1	NLS Females, HSB Females
B-2	Students Academic Experience	Studying: Hours Spent	-	Earnings: Annual	1	NLS Males
B-2	Students Academic Experience	Vocational Courses: More Semesters Of	-	Employment: # Of Months Unemployed	1	HSB Males, HSB Females
G-2	Students Academic Experience	Vocational Program: Health Fields	-	Employed Weeks	2-3	White Males (NLS only)
B-2	Students Academic Experience	Academic Courses: # Of Semesters	NS	Earnings: Annual	1	NLS Males, NLS Females, HSB Males
B-2	Students Academic Experience	Academic Courses: # Of Semesters	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Males
B-2	Students Academic Experience	Academic Courses: # Of Semesters	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
R-1	Students Academic Experience	Academic Credits	NS	Earnings: Hourly	1-7	Males
R-1	Students Academic Experience	Academic Credits	NS	Worked: # Of Hours	1-6	Males
R-1	Students Academic Experience	Academic Curriculum	NS	Earnings: Hourly	1-7	Blacks, Parents Education 12
G-2	Students Academic Experience	Academic Curriculum	NS	Earnings: Weekly	3-4	Black Females, Black Males, White Females, White Males
G-2	Students Academic Experience	Academic Curriculum	NS	Employed Weeks	2-3	Black Females, Black Males, White Females, White Males

*High School and Beyond
**National Longitudinal Survey of the Class of 1972

Appendix A (cont.): Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
R-1	Students Academic Experience	Academic Curriculum	NS	Employment: # Of Weeks Unemployed	1-6	Blacks, Hispanics
G-1	Students Academic Experience	College Curriculum	NS	Occupational Attainment	13	Males
B-2	Students Academic Experience	Education: HS Degree	NS	Earnings: Annual	1	NLS Males, NLS Females, HSB Males, HSB Females
B-2	Students Academic Experience	Education: HS Degree	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Education: HS Degree	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Males
L-1	Students Academic Experience	Education: Years Of Education	NS	Earnings: Annual	1-10	Black Males
K-1	Students Academic Experience	Education: Years Of Education	NS	Employment: # Of Weeks Unemployed	0-5	Black Males
K-1	Students Academic Experience	Education: Years Of Education	NS	Employment: Unemp. To Emp. Weeks	0-5	Black Males
K-1	Students Academic Experience	Education: Years Of Education	NS	Employment: Unemployment Spells	0-5	Black Males
B-2	Students Academic Experience	GPA	NS	Earnings: Annual	1	NLS Females, HSB Males
B-2	Students Academic Experience	GPA	NS	Earnings: Hourly	1-3	HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	GPA	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Males
G-1	Students Academic Experience	Math/Science Courses	NS	Earnings: Annual	12	Males
G-1	Students Academic Experience	Senior Rank	NS	Earnings: Annual	12	Males
G-1	Students Academic Experience	Senior Rank	NS	Occupational Attainment	13	Males
B-2	Students Academic Experience	Studying: Hours Spent	NS	Earnings: Annual	1	NLS Females, HSB Males, HSB Females
B-2	Students Academic Experience	Studying: Hours Spent	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Studying: Hours Spent	NS	Employment: # Of Months Unemployed	1	HSB Females, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Math	NS	Earnings: Annual	1	NLS Males, NLS Females
B-2	Students Academic Experience	Test Score: Math	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Math	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Reading	NS	Earnings: Annual	1	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Reading	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Reading	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Vocabulary	NS	Earnings: Annual	1	HSB Females, NLS Females, NLS Males
B-2	Students Academic Experience	Test Score: Vocabulary	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Males
B-2	Students Academic Experience	Test Score: Vocabulary	NS	Employment: # Of Months Unemployed	1	HSB Females, NLS Females, NLS Males
R-1	Students Academic Experience	Total Credits	NS	Earnings: Hourly	1-7	Males
R-1	Students Academic Experience	Vocational Courses, No Program	NS	Earnings: Hourly	1-7	Males, Females
R-1	Students Academic Experience	Vocational Courses, No Program	NS	Employment: # Of Weeks Unemployed	1-6	Males
B-2	Students Academic Experience	Vocational Courses: # Of Semesters	NS	Earnings: Annual	1	NLS Females, NLS Males
B-2	Students Academic Experience	Vocational Courses: # Of Semesters	NS	Earnings: Hourly	1-3	NLS Males
B-2	Students Academic Experience	Vocational Courses: # Of Semesters	NS	Employment: # Of Months Unemployed	1	NLS Females, NLS Males
R-1	Students Academic Experience	Vocational Credits	NS	Earnings: Hourly	1-7	Males
G-1	Students Academic Experience	Vocational Curriculum	NS	Earnings: Annual	12	Males
R-1	Students Academic Experience	Vocational Curriculum	NS	Earnings: Hourly	1-7	Blacks, Hispanics, Low GPA, Parents Education <12
R-1	Students Academic Experience	Vocational Curriculum	NS	Employment: # Of Weeks Unemployed	1-6	Blacks, Hispanics
G-1	Students Academic Experience	Vocational Curriculum	NS	Occupational Attainment	13	Males
G-2	Students Academic Experience	Vocational: Other Than Business-Commercial	NS	Earnings: Weekly	3-4	Black Females (NLS only), Black Males, White Females, White Males
G-2	Students Academic Experience	Vocational: Other Than Business-Commercial	NS	Employed Weeks	2-3	Black Females (NLS only), Black Males, White Females, White Males
R-1	Students Academic Experience	Vocational Program	NS	Earnings: Hourly	1-7	Males, Females
R-1	Students Academic Experience	Vocational Program Not Used On Job	NS	Earnings: Hourly	1-7	Males, Females
R-1	Students Academic Experience	Vocational Program Not Used On Job	NS	Employment: # Of Weeks Unemployed	1-6	Males
R-1	Students Academic Experience	Vocational Program Not Used On Job	NS	Worked: # Of Hours	1-6	Females
R-1	Students Academic Experience	Vocational Program Used On Job	NS	Earnings: Hourly	1-7	Males
G-2	Students Academic Experience	Vocational Program: Agriculture	NS	Earnings: Weekly	3-4	White Females (NLS only), White Males (NLS only)
G-2	Students Academic Experience	Vocational Program: Agriculture	NS	Employed Weeks	2-3	White Females (NLS only)

Appendix A (cont.): Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
G-2	Students Academic Experience	Vocational Program: Business	NS	Earnings: Weekly	3-4	White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Business	NS	Employed Weeks	2-3	White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Distributive Education	NS	Earnings: Weekly	3-4	White Females (NLS72 only), White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Distributive Education	NS	Employed Weeks	2-3	White Females (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Health Fields	NS	Earnings: Weekly	3-4	White Females (NLS72 only), White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Health Fields	NS	Employed Weeks	2-3	White Females (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Home Economics	NS	Earnings: Weekly	3-4	White Females (NLS72 only), White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Home Economics	NS	Employed Weeks	2-3	White Females (NLS72 only), White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Trade And Industry	NS	Earnings: Weekly	3-4	White Females (NLS72 only), White Males (NLS72 only)
G-2	Students Academic Experience	Vocational Program: Trade And Industry	NS	Employed Weeks	2-3	White Females (NLS72 only), White Males (NLS72 only)
G-2	Students Academic Experience	Vocational: Business Commercial Courses	NS	Earnings: Weekly	3-4	Black Females, Black Males (NLS72 only)
G-2	Students Academic Experience	Vocational: Business Commercial Courses	NS	Earnings: Weekly	3-4	White Males
G-2	Students Academic Experience	Vocational: Business Commercial Courses	NS	Employed Weeks	2-3	Black Females, White Males, Black Males (NLS72), White Females (Parnes)
B-2	Students Family Background	Family Income	+	Earnings: Annual	1	NLS Males, HSB Males, NLS Females, HSB Females
B-2	Students Family Background	Family Income	+	Earnings: Hourly	1-3	HSB Males, NLS Females
M-1	Students Family Background	Family Income	+	Earnings: Hourly	1-4	Males
B-2	Students Family Background	Family Composite	NS	Earnings: Annual	1	NLS Males, NLS Females
B-2	Students Family Background	Family Composite	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females
B-2	Students Family Background	Family Composite	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Females, NLS Males
C-1	Students Family Background	Family Education Or Income	NS	Earnings: Weekly	21-41	White Males
G-1	Students Family Background	Family Income	NS	Earnings: Annual	12	Males
B-2	Students Family Background	Family Income	NS	Earnings: Hourly	1-3	HSB Females, NLS Males
B-2	Students Family Background	Family Income	NS	Employment: # Of Months Unemployed	1	HSB Females, NLS Females, NLS Males
G-1	Students Family Background	Family Income	NS	Occupational Attainment	13	Males
K-1	Students Family Background	Family SES Level	NS	Earnings: Hourly	1-6	White Males
K-1	Students Family Background	Family SES Level	NS	Employment: # Of Weeks Unemployed	0-5	Black Males, White Males
K-1	Students Family Background	Family SES Level	NS	Employment: Unemp. To Emp. Weeks	0-5	Black Males, White Males
K-1	Students Family Background	Family SES Level	NS	Employment: Unemployment Spells	0-5	Black Males, White Males
K-1	Students Family Background	Family SES Level	NS	Occupational Attainment	1-6	White Males
P-1	Students Family Background	Family SES Status: Index	NS	Earnings: Hourly	0-10	Black Males, White Males
B-2	Students Family Background	Fathers Education	NS	Earnings: Annual	1	NLS Males, HSB Males
G-1	Students Family Background	Fathers Education	NS	Earnings: Annual	12	Males
B-2	Students Family Background	Fathers Education	NS	Earnings: Hourly	1-3	HSB Males, NLS Females, NLS Males
J-1	Students Family Background	Fathers Education	NS	Earnings: Hourly	1-24+	White Males Who Are Household Heads
B-2	Students Family Background	Fathers Education	NS	Employment: # Of Months Unemployed	1	NLS Males
G-1	Students Family Background	Fathers Education	NS	Occupational Attainment	13	Males
G-1	Students Family Background	Fathers Occupation	NS	Earnings: Annual	12	Males
G-1	Students Family Background	Fathers Occupation	NS	Occupational Attainment	13	Males
G-1	Students Family Background	Material Possessions	NS	Earnings: Annual	12	Males
G-1	Students Family Background	Material Possessions	NS	Occupational Attainment	13	Males
B-2	Students Family Background	Mothers Education	NS	Earnings: Annual	1	NLS Males, NLS Females, HSB Males, HSB Females
G-1	Students Family Background	Mothers Education	NS	Earnings: Annual	12	Males
B-2	Students Family Background	Mothers Education	NS	Earnings: Hourly	1-3	NLS Females
B-2	Students Family Background	Mothers Education	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
G-1	Students Family Background	Mothers Education	NS	Occupational Attainment	13	Males
B-2	Students Family Background	Race: Black	NS	Earnings: Annual	1	NLS Females, HSB Males
B-2	Students Family Background	Race: Black	NS	Earnings: Hourly	1-3	HSB Males

Appendix A (cont.): Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
B-2	Students Family Background	Race: Black	NS	Employment: # Of Months Unemployed	1	NLS Females
B-2	Students Family Background	Race: Hispanic	NS	Earnings: Annual	1	NLS Males, NLS Females, HSB Males, HSB Females
B-2	Students Family Background	Race: Hispanic	NS	Earnings: Hourly	1-3	HSB Females, NLS Females
B-2	Students Family Background	Race: Hispanic	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Males
M-1	Students Family Background	Race: Non-White	NS	Earnings: Hourly	1-4	Males
M-1	Students Family Background	Race: Non-White	NS	Employed Weeks	1-4	Males
B-2	Students Family Background	Siblings: # Of	NS	Earnings: Annual	1	HSB Males, NLS Females, NLS Males
B-2	Students Family Background	Siblings: # Of	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
K-1	Students Family Background	Siblings: # Of	NS	Earnings: Hourly	1-6	Black Males, White Males
B-2	Students Family Background	Siblings: # Of	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males
K-1	Students Family Background	Siblings: # Of	NS	Employment: # Of Weeks Unemployed	0-5	Black Males, White Males
K-1	Students Family Background	Siblings: # Of	NS	Employment: Unemp. To Emp. Weeks	0-5	Black Males, White Males
K-1	Students Family Background	Siblings: # Of	NS	Employment: Unemployment Spells	0-5	White Males
K-1	Students Family Background	Siblings: # Of	NS	Occupational Attainment	1-6	Black Males
G-1	Students Labor Market Characteristics	Job Aspirations: White Collar	+	Occupational Attainment	13	Males
B-2	Students Labor Market Characteristics	Job In HS	+	Earnings: Annual	1	NLS Males, HSB Males, HSB Females
B-2	Students Labor Market Characteristics	Job In HS	+	Earnings: Hourly	1-3	HSB Males, HSB Females
M-1	Students Labor Market Characteristics	Job Training: on the job (significant in 5th year only)	+	Earnings: Hourly	1-4	Males
M-1	Students Labor Market Characteristics	Job: Hours Worked While In High School	+	Earnings: Hourly	1-4	Males
M-1	Students Labor Market Characteristics	Job: Hours Worked While In High School	+	Employed Weeks	1-4	Males
G-1	Students Labor Market Characteristics	Occupational Attainment	+	Earnings: Annual	12	Males
P-1	Students Labor Market Characteristics	Occupational Information Test Score	+	Earnings: Hourly	0-10	Black Males, White Males
B-2	Students Labor Market Characteristics	Job In HS	-	Employment: # Of Months Unemployed	1	NLS Males, NLS Females, HSB Males, HSB Females
B-2	Students Labor Market Characteristics	Job In HS	NS	Earnings: Hourly	1-3	NLS Females, NLS Males
M-1	Students Labor Market Characteristics	Job Training During High School	NS	Earnings: Hourly	1-4	Males
M-1	Students Labor Market Characteristics	Job Training During High School	NS	Employed Weeks	1-4	Males
G-1	Students Labor Market Characteristics	Occupational Aspirations	NS	Earnings: Annual	12	Males
B-2	Students Labor Market Characteristics	Part-Time Student	NS	Earnings: Annual	1	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Labor Market Characteristics	Part-Time Student	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Labor Market Characteristics	Part-Time Student	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
L-1	Students Other Characteristics	Ability	+	Earnings: Annual	1-10	Black Males, Whites Males
P-1	Students Other Characteristics	Ability	+	Earnings: Hourly	0-10	White Males
B-3	Students Other Characteristics	Ability: Gains In General Intellectual Ability	+	Earnings: Weekly	7-46	Male Household Heads
G-1	Students Other Characteristics	Ability	NS	Earnings: Annual	12	Males
G-1	Students Other Characteristics	Ability	NS	Occupational Attainment	13	Males
P-1	Students Other Characteristics	Ability: IQ Score	NS	Earnings: Hourly	0-10	Black Males
K-1	Students Other Characteristics	Ability: IQ Score	NS	Employment: # Of Weeks Unemployed	0-5	Black Males, White Males
K-1	Students Other Characteristics	Ability: IQ Score	NS	Employment: Unemp. To Emp. Weeks	0-5	Black Males, White Males
K-1	Students Other Characteristics	Ability: IQ Score	NS	Employment: Unemployment Spells	0-5	Black Males, White Males
K-1	Students Other Characteristics	Ability: IQ Score	NS	Occupational Attainment	1-6	Black Males
G-1	Students Other Characteristics	Academic Self-Image	NS	Earnings: Annual	12	Males
G-1	Students Other Characteristics	Academic Self-Image	NS	Occupational Attainment	13	Males
B-2	Students Other Characteristics	Children, Number Of	NS	Earnings: Annual	1	NLS Females, HSB Males
B-2	Students Other Characteristics	Children, Number Of	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males

Appendix A (cont.): Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
B-2	Students Other Characteristics	Children, Number Of	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Males
B-2	Students Other Characteristics	Community Composite	NS	Earnings: Annual	1	NLS Males, NLS Females, HSB Males, HSB Females
B-2	Students Other Characteristics	Community Composite	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females
B-2	Students Other Characteristics	Community Composite	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Males
B-2	Students Other Characteristics	Difficulty Adjusting	NS	Earnings: Annual	1	HSB Females
B-2	Students Other Characteristics	Difficulty Adjusting	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females
B-2	Students Other Characteristics	Difficulty Adjusting	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Males
G-1	Students Other Characteristics	Educational Plans	NS	Earnings: Annual	12	Males
G-1	Students Other Characteristics	Educational Plans	NS	Occupational Attainment	13	Males
B-2	Students Other Characteristics	Handicap	NS	Earnings: Annual	1	NLS Males, NLS Females, HSB Males, HSB Females
B-2	Students Other Characteristics	Handicap	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Students Other Characteristics	Handicap	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Females, NLS Males
K-1	Students Other Characteristics	Health	NS	Employment: # Of Weeks Unemployed	0-5	White Males
K-1	Students Other Characteristics	Health	NS	Employment: Unemp. To Emp. Weeks	0-5	White Males
K-1	Students Other Characteristics	Health	NS	Employment: Unemployment Spells	0-5	Black Males, White Males
K-1	Students Other Characteristics	Health	NS	Occupational Attainment	1-6	Black Males
B-2	Students Other Characteristics	Leadership Positions	NS	Earnings: Annual	1	NLS Males, HSB Males, HSB Females
B-2	Students Other Characteristics	Leadership Positions	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females
B-2	Students Other Characteristics	Leadership Positions	NS	Employment: # Of Months Unemployed	1	HSB Females, NLS Females, NLS Males
B-2	Students Other Characteristics	Locus Of Control	NS	Earnings: Annual	1	NLS Males
B-2	Students Other Characteristics	Locus Of Control	NS	Earnings: Hourly	1-3	HSB Females, NLS Females, NLS Males
B-2	Students Other Characteristics	Locus Of Control	NS	Employment: # Of Months Unemployed	1	NLS Females, NLS Males
B-2	Students Other Characteristics	Married	NS	Earnings: Annual	1	HSB Females
B-2	Students Other Characteristics	Married	NS	Earnings: Hourly	1-3	HSB Females
B-2	Students Other Characteristics	Married	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
B-2	Students Other Characteristics	Self Composite	NS	Earnings: Annual	1	HSB Males, NLS Females, NLS Males
B-2	Students Other Characteristics	Self Composite	NS	Earnings: Hourly	1-3	HSB Females
B-2	Students Other Characteristics	Self Composite	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
B-2	Students Other Characteristics	Work Composite	NS	Earnings: Annual	1	HSB Males, NLS Females, NLS Males
B-2	Students Other Characteristics	Work Composite	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Students Other Characteristics	Work Composite	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Females
W-1	Peer Characteristics	% Of HS Graduating Class Who Received PhDs	+	Earnings: Annual	≥26	Males, In The Army In 1943
C-1	Peer Characteristics	Fraction Of College Graduates In Cohort (State)	NS	Earnings: Weekly	21-41	White Males
C-1	Peer Characteristics	Fraction Of Enrollment In Private School (State)	NS	Earnings: Weekly	21-41	White Males
C-1	Peer Characteristics	Fraction Of HS Graduates In Cohort (State)	NS	Earnings: Weekly	21-41	White Males
G-1	Peer Characteristics	Peers College Plans	NS	Earnings: Annual	12	Males
G-1	Peer Characteristics	Peers College Plans	NS	Occupational Attainment	13	Males
C-1	Peer Characteristics	Per Capita Income Of Parents Generation (State)	NS	Earnings: Weekly	21-41	White Males
P-1	Geographic Indicators	Residence (SMSA Or Not)	+	Earnings: Hourly	0-10	White Males
B-2	Geographic Indicators	School Location: North Central	+	Earnings: Annual	1	NLS Males
B-2	Geographic Indicators	School Location: Northeast	+	Earnings: Annual	1	NLS Females, NLS Males, (HSB Females: New England)
B-2	Geographic Indicators	School Location: Pacific Region	+	Earnings: Annual	1	HSB Females
B-2	Geographic Indicators	School Location: Rural	+	Earnings: Annual	1	HSB Males, NLS Females
B-2	Geographic Indicators	School Location: South	+	Earnings: Annual	1	NLS Females
B-2	Geographic Indicators	School Location: South Atlantic	+	Earnings: Annual	1	HSB Females
B-2	Geographic Indicators	School Location: Suburban	+	Earnings: Annual	1	HSB Females, HSB Males

Appendix A (cont.): Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
B-2	Geographic Indicators	School Location: West North Central	+	Earnings: Annual	1	HSB Females
B-2	Geographic Indicators	School Location: West South Central	+	Earnings: Annual	1	HSB Females
P-1	Geographic Indicators	Residence: South	-	Earnings: Hourly	0-10	Black Males, White Males
B-2	Geographic Indicators	School Location: East North Central	-	Earnings: Annual	1	HSB Males
B-2	Geographic Indicators	School Location: New England	-	Earnings: Annual	1	HSB Males
B-2	Geographic Indicators	School Location: Pacific Region	-	Earnings: Annual	1	HSB Males
B-2	Geographic Indicators	School Location: Rural	-	Earnings: Annual	1	HSB Females
B-2	Geographic Indicators	School Location: South Atlantic	-	Earnings: Annual	1	HSB Males
P-1	Geographic Indicators	Residence (SMSA Or Not)	NS	Earnings: Hourly	0-10	Black Males
M-1	Geographic Indicators	Residence: Rural	NS	Employed Weeks	1-4	Males
M-1	Geographic Indicators	Residence: Urban Location	NS	Employed Weeks	1-4	Males
L-1	Geographic Indicators	Residence: Urban Where Resided At Age 14	NS	Earnings: Annual	1-10	Black Males
B-2	Geographic Indicators	School Location: East North Central	NS	Earnings: Annual	1	HSB Females
B-2	Geographic Indicators	School Location: East North Central	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: East North Central	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: East South Central	NS	Earnings: Annual	1	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: East South Central	NS	Earnings: Hourly	1-3	HSB Females
B-2	Geographic Indicators	School Location: East South Central	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: Mountain Region	NS	Earnings: Annual	1	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: Mountain Region	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: Mountain Region	NS	Employment: # Of Months Unemployed	1	HSB Males
B-2	Geographic Indicators	School Location: North Central	NS	Earnings: Annual	1	NLS Females
B-2	Geographic Indicators	School Location: North Central	NS	Earnings: Hourly	1-3	NLS Females, NLS Males
B-2	Geographic Indicators	School Location: North Central	NS	Employment: # Of Months Unemployed	1	NLS Females
B-2	Geographic Indicators	School Location: North East	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: North East	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Females, NLS Males
B-2	Geographic Indicators	School Location: Pacific Region	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: Pacific Region	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: Rural	NS	Earnings: Annual	1	NLS Males
B-2	Geographic Indicators	School Location: Rural	NS	Earnings: Hourly	1-3	NLS Males
B-2	Geographic Indicators	School Location: Rural	NS	Employment: # Of Months Unemployed	1	HSB Males, NLS Males
B-2	Geographic Indicators	School Location: South	NS	Earnings: Annual	1	NLS Males
B-2	Geographic Indicators	School Location: South	NS	Earnings: Hourly	1-3	NLS Females, NLS Males
B-2	Geographic Indicators	School Location: South	NS	Employment: # Of Months Unemployed	1	NLS Females, NLS Males
B-2	Geographic Indicators	School Location: South Atlantic	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: South Atlantic	NS	Employment: # Of Months Unemployed	1	HSB Females
B-2	Geographic Indicators	School Location: Suburban	NS	Earnings: Annual	1	NLS Females, NLS Males
B-2	Geographic Indicators	School Location: Suburban	NS	Earnings: Hourly	1-3	HSB Females, NLS Females, NLS Males
B-2	Geographic Indicators	School Location: Suburban	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Females, NLS Males
B-2	Geographic Indicators	School Location: West North Central	NS	Earnings: Annual	1	HSB Males
B-2	Geographic Indicators	School Location: West North Central	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
B-2	Geographic Indicators	School Location: West North Central	NS	Employment: # Of Months Unemployed	1	HSB Males
B-2	Geographic Indicators	School Location: West South Central	NS	Earnings: Annual	1	HSB Males
B-2	Geographic Indicators	School Location: West South Central	NS	Earnings: Hourly	1-3	HSB Females, HSB Males
W-1	School Characteristics	Average Enrollment Per Building	+	Earnings: Annual	≥26	Males, In The Army In 1943
W-1	School Characteristics	Expenditures: District Instructional Per ADA	+	Earnings: Annual	≥26	Males, In The Army In 1943
L-1	School Characteristics	Expenditures: District Total Per ADA	+	Earnings: Annual	1-10	Black Males, White Males
W-1	School Characteristics	Expenditures: District Total Per ADA	+	Earnings: Annual	≥26	Males, In The Army In 1943

Appendix A (cont.): Listing of Empirical Findings of Schooling-Related Inputs and Labor Market Outputs

Study Ref #	Input Category	Specific Input	Effect	Labor Market Output Measure	Yrs. Out of HS	Population
J-1	School Characteristics	Expenditures: State Total Per ADA	+	Earnings: Hourly	1-24+	White Males Who Are Household Heads
M-2	School Characteristics	Expenditures: State Total Per ADA	+	Earnings: Hourly	1-24+	Male And Female Household Heads
W-1	School Characteristics	Length Of School Year	+	Earnings: Annual	>= 26	Males, In The Army In 1943
W-1	School Characteristics	Percentage Of Teachers With MA Or Phd	+	Earnings: Annual	>= 26	Males, In The Army In 1943
C-1	School Characteristics	Ratio Of Pupils To Teachers: Decrease In	+	Earnings: Weekly	21-41	White Males
W-1	School Characteristics	Ratio: Ave. Teacher Salary To State Median Income	+	Earnings: Annual	>= 26	Males, In The Army In 1943
C-1	School Characteristics	School Quality	+	Earnings: Weekly	21-41	White Males
W-1	School Characteristics	School Size: Of High School Graduating Class	+	Earnings: Annual	>= 26	Males, In The Army In 1943
G-1	School Characteristics	Teacher Contact	+	Earnings: Annual	12	Males
C-1	School Characteristics	Teacher Salaries	+	Earnings: Weekly	21-41	White Males
W-2	School Characteristics	Teacher Salaries	+	Education: Return To	>= 7	Males Who Live On Farms
W-1	School Characteristics	Teachers: Average Salary	+	Earnings: Annual	>= 26	Males, In The Army In 1943
C-1	School Characteristics	Teachers: Better Educated	+	Earnings: Weekly	21-41	White Males
W-2	School Characteristics	Ratio Of Teachers To Pupils	-	Education: Return To	>= 7	Males Who Live On Farms
K-1	School Characteristics	School Quality	-	Occupational Attainment	1-6	White Males
G-1	School Characteristics	Contact With Teachers	NS	Occupational Attainment	13	Males
W-1	School Characteristics	Ratio Of Teachers To Pupils	NS	Earnings: Annual	>= 26	Males, In The Army In 1943
O-1	School Characteristics	School Quality	NS	Earnings: Hourly	4-11	Black Males, White Males
K-1	School Characteristics	School Quality Index	NS	Earnings: Hourly	1-6	Black Males, White Males
K-1	School Characteristics	School Quality Index	NS	Employment: # Of Weeks Unemployed	0-5	Black Males, White Males
K-1	School Characteristics	School Quality Index	NS	Employment: Unemp. To Emp. Weeks	0-5	Black Males, White Males
K-1	School Characteristics	School Quality Index	NS	Employment: Unemployment Spells	0-5	Black Males, White Males
K-1	School Characteristics	School Quality Index	NS	Occupational Attainment	1-6	Black Males, White Males
G-1	School Characteristics	School: Catholic School	NS	Earnings: Annual	12	Males
G-1	School Characteristics	School: Catholic School	NS	Occupational Attainment	13	Males
P-1	School Characteristics	School: Quality Of High School Attended	NS	Earnings: Hourly	0-10	Black Males, White Males
C-1	School Characteristics	Teachers: Median Years Of Teachers Experience	NS	Earnings: Weekly	21-41	White Males
C-1	School Characteristics	Term Length	NS	Earnings: Weekly	21-41	White Males
B-2	School Characteristics	Upward Bound/Talent Search	NS	Earnings: Annual	1	HSB Females, HSB Males, NLS Females, NLS Males
B-2	School Characteristics	Upward Bound/Talent Search	NS	Earnings: Hourly	1-3	HSB Females, HSB Males, NLS Females, NLS Males
B-2	School Characteristics	Upward Bound/Talent Search	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Females, NLS Males
B-2	School Characteristics	Vocational: Cooperative Vocational Education	NS	Earnings: Annual	1	NLS Females, HSB Males, HSB Females
B-2	School Characteristics	Vocational: Cooperative Vocational Education	NS	Earnings: Hourly	1-3	HSB Females, NLS Females, NLS Males
B-2	School Characteristics	Vocational: Cooperative Vocational Education	NS	Employment: # Of Months Unemployed	1	HSB Females, HSB Males, NLS Males

Appendix B: Detailed Summary of Relevant Studies

(B-1) Benson, Charles S., Maya H. Ibser, and Steven G. Klein (1991)
(B-2) Bishop, John, Arthur Blakemore, and Stuart Low (1985)
(B-3) Bishop, John (1987)
(B-4) Bishop, John (part 1 of a two-part summary) (1985)
(B-5) Bishop, John (part 2 of a two-part summary) (1985)
(C-1) Card, David, and Alan B. Krueger (1992)
(G-1) Griffin, Larry J., and Karl L. Alexander (1978)
(G-2) Gustman, Alan L., and Thomas L. Steinmeier (1982)
(H-1) Hotchkiss, Lawrence (chapter 4) (1984)
(H-2) Hotchkiss, Lawrence (chapter 5) (1984)
(H-3) Hotchkiss, Lawrence (chapter 7) (1984)
(H-4) Hotchkiss, Lawrence, John H. Bishop, and John Gardner (1982)
(J-1) Johnson, George E., and Frank P. Stafford (1973)
(K-1) Kohen, Andrew I. (1973)
(L-1) Link, Charles R., and Edward C. Ratledge (1975)
(M-1) Meyer, Robert ,and David Wise (1982)
(M-2) Morgan, James, and Ismail Sirageldin (1968)
(O-1) O'Neill, June (1990)
(P-1) Parnes, Herbert S., and Andrew I. Kohen (1975)
(R-1) Rumberger, Russell W., and Thomas N. Daymont (1984)
(W-1) Wachtel, Paul (1976)
(W-2) Welch, Finis (1966)

Study: B-1

Benson, Charles S., Maya H. Ibser, and Steven G. Klein

"Economic Returns to Vocational Education and Other Types of Occupational Training"

University of California, Berkeley, May 1991

Source of data:

3 sources of data most consistently referenced: National Longitudinal Survey of the High School Class of 1972, the National Longitudinal Survey of Labor Market Experience, and High School and Beyond.

Level of aggregation of data:

individual

Model:

Some studies used human capital model; others used signaling model.

Number of observations and other characteristics:

NLS72: national sample of 23,000 male and female high school seniors in 1972, from 1,200 schools

NLS-LMS: national sample of approximately 5,000 individuals of different ages. In 1966, collected data on men ages 14-24.

HSB: national sample of 30,000 high school sophomores and 28,000 seniors in 1980.

Observations generally distinguished by schooling: terminal high school graduates or college attendees.

Type of analysis:

meta-analysis; usually multiple regression

separate analyses generally done for males and females, blacks and whites

Labor market outputs:

Employee wage and salary earnings used as reflection of workers' marginal productivity and, therefore, as proxies for human capital increases; if realization is less than productivity gains, returns are understated.

Benson meta-analysis: most returns are for the year following high school graduation

Other outputs:

Social returns (e.g., reduction of taxpayer transfers to unemployed, improved living conditions, reduced crime and homelessness) are frequently neglected as a "return" to vocational education.

Findings:

National Center for Research on Vocational Education meta-analysis of 232 studies performed between 1968 and 1979: mixed results reported for earnings. Some analyses reported no differences, while others reported an initial earnings advantage for vocational graduates, which disappears over time. Trade and industry graduates consistently have higher earnings than do graduates of other vocational programs.

Benson et al. meta-analysis of 20 studies performed between 1979 and 1990: most authors agree that certain forms of vocational education will confer economic benefits, or that vocational education in certain fields consistently results in positive returns for both men and women. It is important to disaggregate by type of program, race, and gender because outcomes differ. Employed male graduates consistently show higher earnings than do general curriculum program graduates. For females, there is less consistency. Others, however, find large economic returns for females and small returns for males.

White females generally show larger returns than do black females.

Much research has overlooked the relationship between specific skill training and related employment—there is some evidence to suggest that vocational education demonstrates greatest outcomes if/when participant moves on to a related field of employment.

School inputs:

Curriculum:

vocational

general

academic

vocational programs, such as trade and industry

Pupil inputs:

race

gender

years of schooling

No information provided on the control variables; includes a discussion of the need for an appropriate comparison group.

Peer inputs:

Study: B-2

Bishop, John, Arthur Blakemore, and Stuart Low

"High School Graduates in the Labor Market: A Comparison of the Class of 1972 and 1980"

National Center for Research in Vocational Education, Ohio State U., Columbus, 1985

Appendix B (cont.): Detailed Summary of Relevant Studies

Source of data:

High School and Beyond 1980 senior cohort; study uses both 1980 and 1982 follow-up surveys

National Longitudinal Survey of High School Class of 1972; study uses 1972 and 1973 follow-up surveys

Level of aggregation of data:

individual

Model:

Study seeks to identify features of the high school experience that are correlated with initial labor market success or failure. Hypothesis: poor school-to-work transition is a result of poor educational preparation. Is back-to-basics appropriate for jobs not requiring higher education? Model looks at the effect of independent variables for 1972 and 1980 cohorts on each of the dependent variables, as well as on whether or not there is a significant difference between classses of 1972 and 1980.

Number of observations and other characteristics:

Analysis excludes students enrolled full-time in higher education or active military service, but includes part-time enrollees in each case. Students have all enrolled in school at least until their senior year of high school. Only jobs not requiring higher education are analyzed.

Type of analysis:

multiple regression—separate regressions run for males and females, and for HSB and NLS data

Labor market outputs:

hourly entry wage rate just after high school completion

hourly wage rate approx. 16 months after high school

annual earnings in the year after high school

fraction of months worked in the year after high school

Other outputs:

Findings:

For the entry wage: significant positive impact from having held a job during high school (HSB); from a greater number of semesters of vocational courses (HSB females only); and from higher parental income (except for NLS males).

For the 16-month wage: significant positive impact from the high school job (HSB); from a higher high school GPA (HSB females only); from a greater number of semesters of vocational courses (except for NLS males); and from higher parental income (HSB males; NLS females). Evidence shows a negative impact on the 16-month wage from a greater number of semesters of academic courses (NLS females only).

For annual earnings: significant positive impact from the high school job (except for females in NLS, males in HSB); from a higher GPA (males in NLS, females in HSB); from a greater number of semesters of vocational courses (HSB males); and from higher parental income (all cases). Again, evidence shows a negative impact from a greater number of semesters of academic courses (HSB females).

For months worked: significant positive impact from high school job; from GPA (females only); and from a greater number of semesters of vocational courses. Again, there was a negative impact from a greater number of semesters of academic courses (females only).

Little evidence re hours spent studying: no impact for females; positive impact for males on entry wage, but negative impact on annual earnings and months worked. Region appears to significantly impact annual earnings, but does not suggest a consistent pattern.

School inputs:

HIGH SCHOOL LOCATION:

rural, suburb

NLS-SPECIFIC LOCATION OPTIONS:

northeast region

northcentral region

southern region

HSB-SPECIFIC LOCATION OPTIONS:

New England

South Atlantic

East South Central

West South Central

East North Central

West North Central

Mountain region

Pacific region

semesters in academic courses in high school

semesters in vocational courses in high school

Pupil inputs:

self-concept composite

locus of control composite

work composite (importance of work, etc.)

community composite

family composite

handicap

number of siblings

Hispanic

black
part-time student after high school
age (HSB only)
measure of individual's adjustment to high school (1-4 scale)
GPA
hours/week worked during senior year
hours/week spent on homework in senior year
received high school degree
math score
vocabulary score
reading score
# of leadership positions held in high school
participated in cooperative education or work study program
participated in Upward Bound or Talent Search
participated in CETA (HSB only)
father's education in # of years completed
mother's education in # of years completed
parents' income, in thousands
whether income is a missing variable or not
marital status 1 year after high school
whether there are child dependents
enrolled part-time in military reserves
gender

Peer inputs:

Study: B-3

Bishop, John

"Is the Test Score Decline Responsible for the Productivity Growth Decline?"

Working Paper No. 87-05. State U. of New York, School of Industrial and Labor Relations, Ithaca, 1987

Source of data:

Panel Study of Income Dynamics (PSID) data; SAT scores; ACT scores; IQ tests, Current Population Surveys

Level of aggregation of data:

individual

Model:

The post-1966 decline in SAT scores may signal a drop in the quality of young entrants, which in turn is responsible for some of the productivity growth slowdown. Report analyzes the effect of general intellectual achievement and years of schooling on productivity and wage rate.

Number of observations and other characteristics:

various populations used:

terminal high school graduates

army recruits

people at all school levels, including those with only several years of primary school

PSID data: 1,774 male household heads 25-64 years old in 1971

Type of analysis:

multiple regression

graphical analyses

use of previous research, by author and others

Labor market outputs:

log of weekly earnings, 7-46 years after high school

Other outputs:

Findings:

Gains in GIA (general intellectual ability) account for 35% of the total effect of schooling on wage rates.

When workers doing the same job were compared, there were significant differences in productivity that correlate with GIA, but much smaller differences in wages. If a student's GIA is raised by one population s.d., his or her productivity as an adult will on average be 37% higher even if the improved GIA does not lead to additional schooling. Given the test score decline, this implies that the decline signals a significant deterioration in the quality of young entrants into the workforce. From 1948-1973, gains in GIA of working population that were not attributable to increases in schooling improved the labor quality by .35% per year. Other research has estimated increases in years of schooling to have caused labor quality to grow .725% per year.

Rate of growth of labor quality was .4% per year lower between 1980 and 1987 than it would have been if test scores had continued to grow at the rate that prevailed from 1942-1966. Growth rates were projected to be .31% per year in 1990s and .2% per year in the first decade of the 21st century. Test scores will continue to place a drag on productivity well into the 21st century even if they now improve.

School inputs:

Pupil inputs:

GIA (general intellectual ability), measured through such tests as the Iowa Test of Educational Development, the Armed Forces Qualifications Test, the SAT, the ACT, and the Science Research Associates achievement series

years of schooling

age

Peer inputs:

Study: B-4, Part 1 of a Two-Part Summary

Bishop, John

"Preparing Youth for Employment"

The National Center for Research in Vocational Education, Ohio State U., Columbus, February 1985

Source of data:

High School and Beyond 1980 senior cohort; study uses both 1980 and 1982 follow-up surveys

Level of aggregation of data:

individual

Model:

In PART 1, discussed below, author examines the effects of student curricular choices on labor market outcomes, in particular, whether students not going on to college full-time should opt for more demanding academic courses at the expense of vocational courses.

In PART 2, discussed in following summary, author compares schools with different curricula to see the effect on occupational expectations and work values.

Number of observations and other characteristics:

3,000 seniors in 1980 who did not go on to college full-time

Type of analysis:

multiple regression—separate analyses done for males and females

Labor market outputs:

hourly wage in 1981, one year after high school graduation

percentage of months worked in 21 months after graduation

annual earnings in 1981, one year after high school graduation

Other outputs:

Findings:

Vocational education has large positive impacts on wages, hours, and earnings immediately after high school for those who don't go on to college, but there is a "best" mix of vocational and academic courses. The mix of courses that maximizes earnings in the calendar year after high school is 36% vocational for males, and 48% vocational for females.

Those students who took one or fewer vocational courses had wage rates that were 7.5% lower, worked about 19% less, and earned 32% less than students who took 4 vocational courses in their last 3 years of high school. Those students who took 12 to 14 full-year academic courses had wage rates that were 3.5% lower, worked about 8.5% less, and earned 14% less than students who took 6 to 8 full-year academic courses.

4 vocational courses for males were found to have a significant positive effect on wage rate and earnings; this was especially positive if they got an A or B in a trade-technical course.
4 vocational courses for females were found to have a significant positive effect on months worked and earnings. Higher grades in business and office courses initially resulted in higher wages, but this effect faded 18 months after graduation.

Effects of academic achievement on job productivity are greater in jobs of highest intellectual complexity, but basic skills are very important for clerical and semi-skilled blue collar jobs. Employers do not recognize greater contributions of well-educated workers by paying them higher wages.

School inputs:

# of vocational courses taken in high school

# of academic courses taken in high school

Pupil inputs:

family income

education of mother (unclear how measured)

education of father (unclear how measured)

occupation of mother

occupation of father

# of siblings

locus of control

self-esteem

work attitudes

gender

Peer inputs:

Study: B-5, Part 2 of a Two-Part Summary

Bishop, John

"Preparing Youth for Employment"

The National Center for Research in Vocational Education, Ohio State U., Columbus, February 1985

Source of data:

High School and Beyond 1980 sophomore cohort; study uses 1980 and 1982 student surveys and the 1980 principal questionnaire

Level of aggregation of data:

school

individual level data for the pupil control variables

Appendix B (cont.): Detailed Summary of Relevant Studies

Model:
Study compares schools with different curricula to see the effect on students' occupational expectations and work values when they are high school seniors.

Number of observations and other characteristics:
national sample of 30,000 youths who were high school sophomores in 1980

Type of analysis:
multiple regression—separate regressions run for males and females

Labor market outputs:
occupational expectations when high school seniors
work values when high school seniors

Other outputs:
verbal, math, science, civics test scores
educational expectations
deportment index
self-esteem
locus of control
grades in school

Findings:
An increase in the number of math and science courses offered by the school had a significant positive impact on 3 of 4 test scores (not math). Increases in the number of vocational courses offered by the school decreased educational expectations, locus of control, and verbal achievement.

The only impact on the 2 labor market outputs of any significance ($p<.05$) was an increase in the share of sophomores in the vocational track at the expense of the general track, which had a small negative effect on occupational expectations.

An increase in the share of sophomores in the vocational track at the expense of the academic track significantly decreased educational expectations.

Other information:
At the end of the document, Bishop includes a useful summary table of studies that looked at the impact of high school achievement on wages and earnings of graduates. Bishop summarizes the findings from this meta-analysis by saying that as individuals become older, those with good academic records tend to benefit more from wage increases. Several studies share the finding that the relationship between academic achievement and earnings immediately after high school is zero or even negative, and then grows considerably as the respondent ages. Recent studies that have examined academic achievement's impact on annual earnings, employment, and hourly wage rates typically find that achievement improves annual earnings and the ability to find and keep jobs considerably more than it raises the wage rate.

School inputs:
STUDENT BODY CONTROL VARIABLES:
school mean of family income
% of class of '79 attending college
% of students who had dropped out
% Hispanic students
% black students
% of students who do not speak English at home
school size

SCHOOL FEATURES CONTROLLED FOR:
Catholic, other private, public
busing
court orders for desegregation
unionization
teacher strikes
facilities
whether last school levy passed
teacher/student ratio
teacher/teacher aide ratio
% of teachers with MA or PhD or 10+ years experience
teacher absences
entry pay
school participation in Upward Bound and Cooperative Education
competency test
ability grouping
average daily attendance
school deportment index
school problem index based on principal reports
school mean of sophomore reports of school quality index
school mean of school rating index
# of class hours per year

VARIABLES USED TO GAUGE CURRICULAR EMPHASIS:
distribution of sophomores between vocational, general, and academic tracks
# of math and science courses offered
# of vocational courses offered

# of non-academic courses offered

# of non-vocational courses offered

Pupil inputs:

SES background variables

Base year measures:

grades

test scores

self-esteem

locus of control

educational expectations

occupational expectations

parents' career expectations for their children

curricular track

# of courses taken between sophomore and senior year in a variety of subjects

whether had taken: algebra II, trigonometry, calculus, physics, chemistry, biology, honors English, honors math

gender

Peer inputs:

Study: C-1

Card, David, and Alan B. Krueger

"Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States" *Journal of Political Economy* (1992), vol. 100, no. 1, 1-40.

Source of data:

Earnings data from 1980 census; Public-Use Sample of the 1940, 1950, and 1960 census; the Biennial Survey of Education and the Digest of Education Statistics of the U.S. Department of Education; Statistical Abstract of the U.S., 1930 and 1957 editions; the U.S. Department of Labor Employment and Training Administration Handbook, number 394; and State Personal Income: estimates for 1929-1982 (revised).

Level of aggregation of data:

individual data, aggregated into 147 groups according to age and state of birth

Model:

Study measures the effects of school quality (pupil/teacher ratios, average term length, and relative teacher pay) on the rate of return to education for men born between 1920 and 1949. 2-step model:

1) Average rate of return for cohort = f (state of birth + state of residence + regional differences in the return to education)

2a) Estimated rate of return for cohort = f (school quality variables)

2b) Estimated rate of return for cohort = f (school quality variables + teacher characteristics + peer inputs + cohort)

(Individuals are assigned the mean levels of school quality for their state of birth and cohort)

Number of observations and other characteristics:

279,008 white men born between 1920-29; 299,063 white men born between 1930-39; and 441,675 white men born between 1940-49. All worked in 1979 and had annual wages of at least $101 and average weekly wages of at least $66 but less than $2,500. Respondents had anywhere from 0 to 20 years of education; none attended private school.

Type of analysis:

multiple regression

Labor market outputs:

log of weekly earnings for 1979 (ages 39-59)— approximately 21-41 years after high school.

Other outputs:

Findings:

Men educated in states with higher-quality schools have a higher return to additional years of schooling; an increase in school quality increases the average earnings of students.

A decrease in the pupil/teacher ratio by 10 students is associated with a .9% increase in return to years of schooling (above a threshold level). If the threshold level is 8 years of schooling, this reduction raises earnings of high school graduates by 3.6%.

A 30% increase in the relative teacher salaries raises the rate of return to education by .3% and earnings of high school graduates by 1.2%.

Rates of return are also better for individuals from states with better-educated teachers and with a higher fraction of female teachers.

Holding constant school quality measures, there is no evidence that parental income, parental education, the fraction of college or HS graduates, or the rate of enrollment in private schools (all aggregated to the state level for each cohort) affect average state-level rates of return.

Term length is not a significant school quality variable, nor is teachers' experience.

Cohort dummies are very significant; omission leads to an overstatement of school quality effects.

School inputs:

SCHOOL QUALITY VARIABLES (mean levels by state of birth and by cohort):

pupil/teacher ratio

term length in days

average annual teacher pay, normalized by the level of average wages in the state and by the national average of wages for the same year

TEACHER CHARACTERISTICS:

fraction of male teachers

mean years of education of teachers

Pupil inputs:

state of birth

state currently resides in

region of country currently resides in

age

years of schooling completed

years of labor market experience

marital status

whether respondent lives in SMSA

race

Peer inputs:

STATE VARIABLES:

median education of parents' generation

per capita income of parents' generation

fraction of high school graduates in cohort

fraction of college graduates in cohort

fraction of enrollment in private schools

gap between pupil/teacher ratio in Catholic and public schools

Study: G-1

Griffin, Larry J., and Karl L. Alexander

"Schooling and Socioeconomic Attainments: High School and College Influences"

American Journal of Sociology (1978), vol. 84, no. 2, 319-347.

Source of data:

1955 Educational Testing Service survey of approx. 35,000 high school sophomores in 97 schools

1970 follow-up of 4,151 of same respondents (20-item test of academic aptitude and questionnaire)

Level of aggregation of data:

individual data, aggregated to the school level to examine among-school differences

individual data; used to examine within-school differences

Model:

Study examines the ways in which among-school differences and within-school resources and educational experiences affect subsequent labor market achievement.

Model looks at socioeconomic consequences of qualitative variations in educational experiences in 2 parts:

1) examines differences in student labor market outputs that occur between schools, by using school dummy variables and pupil controls;

2) examines differences in student labor market outputs that occur within schools, by analyzing student differences.

Number of observations and other characteristics:

338 males who terminated schooling at high school graduation

525 males who pursued some postsecondary education (these findings are not discussed in this summary)

Type of analysis:

analysis of variance, both among and within schools

Labor market outputs:

occupational attainment in 1970 (Duncan SEI scale)—13 years after high school graduation

annual earnings as of 1969 (used midpoint of 24 income categories)—12 years after high school graduation

Other outputs:

Findings:

Among-school findings:

15% of the variance in occupational attainment is among schools; this reduces to 11.9% after controlling for SES variables and for aptitude. Therefore, school and peer inputs reduce R-squared to 11.0. School differences alone account for 11% of the variance in occupational attainment for high school graduates.

19% of variance in earnings is among schools; this reduces to 17% after controlling for SES variables and aptitude. With school inputs, the variance is reduced to 15.5%. Therefore, 15.5% of the variance in earnings of high school graduates is accounted for by secondary school differences even after controlling for all other variables in the model, including occupational attainment in 1970.

Within-school findings:

Occupational attainment: white-collar job aspirations and increased math and science coursework have a significant positive impact on later occupational attainment. The R-squared for coursework alone

is 12.5%; this reduces to 10.1% after controlling for occupational aspirations.

Earnings of high school graduates: teacher contact (+), high school academic track (-), and occupational attainment (+) have significant impact on annual earnings of HS graduates. 7% of the variance on earnings is from occupational attainment; this reduces to 5.2% after controlling for college curriculum in high school.

School inputs:

school personnel influence: response to "To what extent have you discussed going to college with the teachers or guidance counselors in your school?" (1955)

41 school dummy variables

senior year enrollment: college curriculum or vocational curriculum

semesters of math and science taken while in high school

Pupil inputs:

1970 VARIABLES:

mother's education in years completed

father's education in years completed

father's occupation while respondent was in high school (Duncan scale)

parents' income while in high school (used midpoint of 24 income categories)

13-item factor-weighted "acquisition" index of household possessions

occupational attainment

academic self-image, measured from a factor-weighted scale constructed from 9 self-evaluation items dealing with high school performance and problems

1955 VARIABLES:

academic aptitude (Educational Testing Service test)

educational expectations: are you a "college-goer; possible college-goer; noncollege-goer?"

occupational aspirations—for HS grads, dummy variable: prof./ managerial or not

parent influence: response to "To what extent have you discussed going to college with your parents?"

senior class standing (quintile ranking)

Peer inputs:

peer college orientations (college plans of friends and proportion of peers planning to attend college) Index constructed by summing the responses from these 2 1955 questionnaire items.

Study: G-2

Gustman, Alan L., and Thomas L. Steinmeier

"The Relation Between Vocational Training in High School and Economic Outcomes"

Industrial and Labor Relations Review (1982), vol. 36, no. 1, 73-87.

Source of data:

1972 Parnes Survey, U.S. Department of Labor

National Longitudinal Survey of the High School Class of 1972; used 1976 follow-up

Level of aggregation of data:

individual data, aggregated into 4 race and gender groupings: black males, white males, black females, white females

Model:

Two analyses done: 1) to determine whether enrollment alone in a vocational program had an impact on one of the labor market outputs, and 2) to determine whether the actual number of semester hours of vocational coursework taken had an impact on one of the labor market outputs. Study also seeks to determine whether the findings remain robust when different surveys and time periods are analyzed.

Number of observations and other characteristics:

From the 1972 Parnes Survey, 167 individuals with 12 years of schooling, 21 years old.

From 1976 NLS72 data, 2405 individuals 4 years after high school graduation, approximately 22 years old.

Any respondents enrolled in higher education or the military from either survey are excluded.

Type of analysis:

multiple regression—separate regressions for white males, black males, white females, black females

Labor market outputs:

mean weekly earnings in 1976 dollars (for each group)—4 yrs. after high school graduation for NLS; approximately 3 years after high school for Parnes

mean weeks employed (NLS: weeks worked in previous year (1975) or 3 yrs. after high school graduation; Parnes: weeks worked since last interview, which was slightly more or less than 1 year, at about age 20)

Other outputs:

Hourly wage and annual earnings were labor market output measures used to test the validity of findings when weekly earnings were used.

Findings:

No significant differences were found between black or white male graduates of vocational programs and their counterparts in general programs for either outcome measure.

For white males, there was a significant negative relationship between specializing in a health field and the number of weeks worked in the previous year.

For white women, the Parnes data indicate a significant positive effect of business-commercial programs on weekly earnings when compared to their counterparts in general programs. The significance of this finding does not hold up when using hourly wage as the dependent variable. A similar significant positive effect is found when tested using annual earnings. NLS72 data also show a significant positive effect for business-commercial programs on weekly earnings and employment (2 more weeks per year) for white women, when compared to their counterparts in general programs.

Black female graduates of business-commercial programs were found to be unemployed 4 more weeks per year than their counterparts in general programs, but the finding is not statistically significant.

The marginal effect of additional vocational courses is very weak, even when enrollment in a vocational program has a significant overall impact. High school environment was not statistically significant.

School inputs:

HIGH SCHOOL PROGRAM:

vocational, other than business-commercial

business-commercial

general

academic

HIGH SCHOOL ENVIRONMENT:

dummy variable equaling 1 if more than half the students are enrolled in vocational courses

FURTHER HIGH SCHOOL PROGRAM DISAGGREGATION:

(NLS72, white males and females only, due to small cell sizes for blacks):

agricultural program

business

distributive education

health fields

home economics

trade and industry

# of semester hours taken in:

agricultural program

business

distributive education

health fields

home economics

trade and industry

Pupil inputs:

gender

race

aptitude index

SES of parents

residence in SMSA

Peer inputs:

Study: H-1, Chapter 4 of a Three-Chapter Summary

Hotchkiss, Lawrence

"Effects of Schooling on Cognitive, Attitudinal, and Behavioral Outcomes" (Chapter 4)

National Center for Research in Vocational Education, Ohio State U., Columbus 1984

Source of data:

High School and Beyond 1980 sophomore cohort; study uses both 1980 and 1982 follow-up surveys

Level of aggregation of data:

individual

Model:

Study examines 2 types of outcomes: those that measure cognitive skills and those that the authors have determined are "relevant to employment." 2 models are used:

1) measures the effects of personal characteristics and SES on the outcomes;

2) measures total school effects (using dummy variables) on changes in the outcomes between 1980 and 1982.

Number of observations and other characteristics:

national sample of 27,000 youth who were high school sophomores in 1980, seniors in 1982

Type of analysis:

multiple partial correlations

Labor market outputs:

Values were collected from both the 1980 and 1982 surveys.

(These outcomes are defined as "relevant to employment")

educational expectation, in years of schooling

occupational expectation (Duncan SEI scores)

self-esteem (4 questions were used to evaluate)

locus of control (4 questions were used to evaluate)

work values (3 questions were used to evaluate), measured by scale of importance of work to individual

Other outputs:

deportment (measured from days absent, tardy, discipline problems, suspensions, cut classes, in trouble with the law)

verbal test score

math test score

science test score

civics test score

Findings:

School effects are not as large as the combined effects of SES variables, but are not negligible. For each outcome variable, the partial correlation reflecting effects of attending different schools is statistically significant and of moderate magnitude. The effects of background on the 10 outcome variables decline with time, while the effects of schools increase (based on the ratio of effects with and without lagged dependent variables). Significant cross-sectional effects of background and personal characteristics on 5 labor market outcomes:

educational expectations: gender; race; father/mother not in household (both -); father's/mother's

occupation and education; number of siblings (-); family income; possessions

occupational expectations: gender (-); race; father/mother not in household (both -); father's/mother's

occupation and education; number of siblings (-); family income; possessions

self-esteem: gender (-); race; father's/mother's education; number of siblings (-); family income; possessions

locus of control: gender; race; ethnicity (-); father/mother not in household (both -); father's occupation and father's/mother's education; # of siblings (-); family income; possessions; rooms in home

work values: gender (-); race; ethnicity; father (+)/mother (-) not in household; number of siblings (-); family income; possessions

School inputs:

1,014 schools (dummy variables used for the schools themselves, rather than certain explicit school quality variables)

Pupil inputs:

mother's education in years of school completed

father's education in years of school completed

mother's occupation (Duncan SEI)

father's occupation (Duncan SEI)

family income (log)

# of siblings

race: black, non-black

gender

ethnicity: Hispanic, non-Hispanic

possessions index (# marked from a checklist)

home ownership (dummy variable)

# of rooms in the house

father not in household

mother not in household

Peer inputs:

Study: H-2, Chapter 5 of a Three-Chapter Summary

Hotchkiss, Lawrence

"Effects of Schooling on Cognitive, Attitudinal, and Behavioral Outcomes" (Chapter 5)

National Center for Research in Vocational Education, Ohio State U., Columbus, 1984

Source of data:

High School and Beyond 1980 sophomore cohort; uses both the 1980 and 1982 follow-up surveys as well as the 1980 school file

Level of aggregation of data:

school; uses individual data aggregated to the school level for the independent variables

individual data; used for the dependent variables

Model:

40 school characteristics are studied to assess the role they play in school differences.

3 analyses are done:

1) compares the effects of 40 school characteristics to the overall school effects using school dummy variables

Appendix B (cont.): Detailed Summary of Relevant Studies

2) divides the school characteristics into 7 broad categories and compares the effects of each category as well as the effect of region and individual SES on the outcomes

3) divides policy instruments into 6 subsets of variables that "are relatively easily influenced by deliberative policy of school personnel" and examines the effects on the 10 outcomes.

Number of observations and other characteristics:

A national sample of 27,000 youth who were high school sophomores in 1980, seniors in 1982

Type of analysis:

multiple regression; multiple partial correlations

Labor market outputs:

(These outcomes are defined as "relevant to employment")

educational expectation, in years of schooling

occupational expectation (Duncan SEI scores)

self-esteem (4 questions were used to evaluate)

locus of control (4 questions were used to evaluate)

work values (3 questions were used to evaluate)

Other outputs:

deportment (measured from days absent, tardy, discipline problems, suspensions, cut classes, in trouble with the law)

verbal test score

math test score

science test score

civics test score

Findings:

FOR #1 ABOVE: The effect of 40 school variables is always slightly smaller than with a school dummy variable, but is still important. The combined impact of 40 variables is 50-90% of the total between-school effects.

FOR #2 ABOVE: SES background variables produce the largest multiple partial correlations, but are only "modestly larger" than the combined effects of all 40 school characteristics. Regional differences persist for 6 of the 10 outcomes (4 test scores, school deportment, and locus of control). Demographic composition of students, student context, and 20 policy variables have fairly consistent strong effects.

School policy variables have significant positive effects ($p<.001$) on all but work values and self-esteem.

Sector is statistically significant only for work values.

FOR #3 ABOVE: When 20 policy variables are disaggregated into 6 subsets, curriculum and school deportment have the most consistently significant positive effects across the dependent variables (within the curriculum, math and science courses have most important effect). Deportment effects disappear when controls for endogenous variables are included. Other significant findings are: Average family income increases growth in math test score performance and educational and career expectations. A higher % of black students decreases test scores, increases educational and occupational expectations, self-esteem, and work values. A higher % of college-bound students raises test scores and career expectations; a higher % of dropouts lowers these. Teacher/student ratios, teacher and staff characteristics, and school aggregates of time spent in class do not have strong effects. A higher % of 10th graders in vocational track lowers educational expectations. School resources and facilities have a significant positive effect only on occupational expectation.

School inputs:

(numbers indicate 7 broad categories)

1) sector (public, Catholic, other private)

2) school desegregation: % of students riding a bus; court order to desegregate

3) DEMOGRAPHIC AND SES:

- % of black students
- % of Hispanic students
- # of students
- % of students in homes without English
- average family income

4) TEACHER LABOR RELATIONS:

- % of teachers belonging to NEA
- % of teachers belonging to AFT
- occurrence of strike within last 4 years

5) SCHOOL POLICY (6 subsets)

FACILITIES AND RESOURCES:

# of vocational facilities

# of academic facilities

ratio of teachers to students

whether last school tax levy passed

TEACHER CHARACTERISTICS:

ratio of non-teaching staff to teachers

ratio of teachers' aides to teachers

proportion of staff with graduate degree

salary paid to entry-level teachers

proportion of staff with 10+ years tenure

average teacher absenteeism

CURRICULUM:

# of math and science courses

# of vocational courses

"frills" courses (driver's training, art, etc.)
participation in Upward Bound
participation in cooperative voc. ed
PEDAGOGICAL:
requirement of a competency test for graduation
ability grouping of 10th grade English
EXPOSURE:
# of hours of class time in school year
average daily attendance
DISCIPLINE:
school mean of deportment index calculated from student data
6) SCHOOL QUALITY JUDGMENTS
3 indices of opinions about the school:
2 student indices aggregated to school level
1 index of principals' reactions to list of potential school problems

Pupil inputs:
mother's education in years of school completed
father's education in years of school completed
mother's occupation (Duncan SEI)
father's occupation (Duncan SEI)
family income (log)
# of siblings
presence of parents in home (mother; father)
race: black, non-black
gender
ethnicity: Hispanic, non-Hispanic
possessions index (# marked from a checklist)
home ownership
# of rooms in the house

Peer inputs:
(numbers indicate 7 broad categories)
8 region dummy variables
7) STUDENT CONTEXT
% of seniors attending college
% of dropouts
% sophomores in general curriculum
% sophomores in vocational track

Study: H-3, Chapter 7 of a Three-Chapter Summary

Hotchkiss, Lawrence

"Effects of Curriculum and Coursework on Cognitive and Non-Cognitive Outcomes" (Chapter 7)

National Center for Research in Vocational Education, Ohio State U., Columbus, 1984

Source of data:
High School and Beyond 1980 sophomore cohort; uses both the 1980 and 1982 follow-up surveys as well as the 1980 school file

Level of aggregation of data:
individual

Model:
Study examines effects of curriculum track and coursework on 10 outcome variables to address two questions: Are correlations between academic track and outcomes due to effects of track membership or due to selection into track? and, Are the effects of track placement mediated by type of coursework?

3 models used:

#1: dependent variable (time 2) = f (SES variables + lagged values of 5 "other variables" + lagged 10 outcomes + 5 "other variables" (GPA; mother's expectations, etc.) + academic track)

#2: senior year track = f (SES variables + sophomore year track + variables hypothesized to intervene between SES and track (GPA, test scores))

#3: dependent variable (time 2) = f (SES variables + lagged values of 5 "other variables" + lagged 10 outcomes + 5 "other variables" (GPA; mother's expectations, etc.) + academic track + amount of coursework)

Number of observations and other characteristics:
national sample of 27,000 youth who were high school sophomores in 1980, seniors in 1982

Type of analysis:
multiple regression—separate regressions run for males and females

Labor market outputs:
(These outcomes are defined as "relevant to employment")
educational expectation, in years of schooling
occupational expectation (Duncan SEI scores)
self-esteem (4 questions were used to evaluate)
locus of control (4 questions were used to evaluate)
work values (3 questions were used to evaluate)

Other outputs:

deportment (measured from days absent, tardy, discipline problems, suspensions, cut classes, in trouble with the law)

verbal test score

math test score

science test score

civics test score

Findings:

FOR MODEL #1:

males and females: academic track has significant positive effects on math test scores and educational expectations;

males only: academic track has significant positive effect on self-esteem.

FOR MODEL #2:

father's education, mother's education (though not for males), and family income show consistent effects on senior year track: increases in these inputs are associated with an increase in the chance of being in academic track.

FOR MODEL #3:

Most of the statistically significant effects in Model 1 retain significance when controls for coursework are added. The conclusion from this is that the significant and substantively important effects of track cannot be fully accounted for by the pattern of courses that students take during the last 2 years of high school; informal discrimination may account for effects of tracking on 10 outcomes.

Academic courses tend to increase test scores and career expectations; vocational courses tend to do the reverse.

School inputs:

academic vs. vocational track (dummy)

ACADEMIC:

# of yrs. of math taken 10th-12th grades

# of yrs. of English taken 10th-12th grades

# of yrs. of foreign language taken 10th-12th grades

# of yrs. of history and civics taken 10th-12th grades

# of yrs. of science taken 10th-12th grades

VOCATIONAL:

# of yrs. of business and office taken 10th-12th grades

# of yrs. of trade and industry taken 10th-12th grades

# of yrs. of technical vocational courses taken 10th-12th grades

Pupil inputs:

mother's education in years of school completed

father's education in years of school completed

mother's occupation (Duncan SEI)

father's occupation (Duncan SEI)

family income (log)

# of siblings

race: black, non-black

gender

ethnicity: Hispanic, non-Hispanic

possessions index (# marked from a checklist)

home ownership

# of rooms in the house

father not in household

mother not in household

5 "OTHER VARIABLES"

perceived college ability: response on 5 point scale

educational aspirations of mother for youth (# of years of schooling)

mother's college expectation of youth (dummy)

father's college expectation of youth (dummy)

GPA on 4 point scale

Peer inputs:

8 regional variables:

Mountain

Pacific

East south central

West south central

East north central

West north central

Northeast

Southeast

Study: H-4

Hotchkiss, Lawrence, John H. Bishop, and John Gardner

"Effects of Individual and School Characteristics on Part-Time Work of High School Seniors"

Technical Report, National Center for Research in Vocational Education, Ohio State U., Columbus, 1982

Appendix B (cont.): Detailed Summary of Relevant Studies

Source of data:

High School and Beyond senior cohort in 1980; uses 1980 survey and the 1980 administrators' questionnaire (some data is also used from the 1980 High School and Beyond sophomore survey)

Level of aggregation of data:

school; uses individual data aggregated to the school level for several school inputs (for the demand model described below)

individual (for supply model described below)

Model:

Study, through a demand and a supply model, seeks to identify school characteristics that promote desirable work outcomes.

Demand model: the dependent variables are wage and unemployment. To the extent that school quality and other school characteristics influence employers' demand for student workers, the model assumes that employers prefer students from "high quality" schools with high SES profiles and a low percentage of minority students.

Supply model: the dependent variables are hours worked and labor force participation. To the extent that work and school are competitors for students' time, wage and non-wage benefits of work will exercise positive effects on hours of work supplied by the students (a high valuation of schooling will have a negative effect on the number of hours of work supplied by the student).

Number of observations and other characteristics:

28,000 high school seniors in 1980

Type of analysis:

2 stage least squares and OLS

Labor market outputs:

(all variables are for high school seniors)

hours worked last week (0 to 40)

hourly wage rate of current or most recent job (1 to 5$); independent and dependent variable

labor force status (dummy: 1=in the labor force)

unemployment status (dummy: 1=unemployed, but looked for work)

Other outputs:

Findings:

Results support the supply model: wage and non-wage compensation for work have positive effects on supply of labor; the valuation of schooling has a negative effect on supply. Results do not support the demand model: school rating index shows no effects on employment outcomes, though the index from administrators' opinions has a negative effect on unemployment. Both models show race effects: blacks and Hispanics are disadvantaged on all 4 dependent variables, though Hispanics are less disadvantaged than blacks and the finding is not significant for the wage rate.

Attendance at a vocational school increases the wage rate, as does attendance at a private school.

Desegregation has no negative effects and is associated with a somewhat higher wage rate and tendency to work more.

Females worked significantly more hours last week than males, were more likely to be in the labor force, less likely to be unemployed, and encountered a significant wage disadvantage when compared to males.

School inputs:

SCHOOL CHARACTERISTICS (school means) average within schools of both sophomores' and seniors' ratings

school rating index: average of scores on 6 items

1) condition of school building
2) quality of school library
3) quality of instruction
4) effectiveness of discipline
5) fairness of discipline
6) reputation of school in community

deportment index

6 items on questionnaire as to: problems in school of attendance, cutting classes, talking back, following instructions, fighting

SCHOOL CHARACTERISTICS (not school means):

from administrator questionnaire, mean of 12 items: absenteeism, cutting, parent interest, physical conflicts, theft, vandalism, drugs or alcohol, rape, weapons, verbal abuse

per pupil expenditures (log)

percentage Hispanic enrollment

percentage black enrollment

SCHOOL CONTEXT (school means):

school mean of father's occupational SES

school mean of mother's occupational SES

school mean of family income

high school size

POLICY-RELEVANT VARIABLES:

(dummy variables)

private school

vocational school

minimum competency requirement

school participation in CETA

school participation in co-op education

school participation in work study
under court order to desegregate

Pupil inputs:
work values: average of scores on 3 items
1) importance of work
2) importance of steady employment
3) importance of earning money
interest in school (dummy variable)
college expectation in grade 10
index of deportment: average of scores on 6 items
1) how frequently absent
2) how frequently tardy
3) whether had discipline problems
4) whether suspended
5) whether cut classes
6) whether ever in trouble with the law

race (black and other)
ethnicity (Hispanic and other)
gender
father's occupational status (Duncan index)
mother's occupational status
father's education in years of schooling completed
mother's education in years of schooling completed
family income (log)
estimate of # of siblings
whether born in the US
mother's work history
whether has a child that lives in household
mean of 8 vocabulary test items
mean of 8 reading test items
mean of 8 math test items

lagged variables:
average hrs/week worked last summer
average hrs/week worked last school year

Other inputs:
8 regional variables:
New England
South Atlantic
East south central
Mountain
Pacific
Middle Atlantic
West north central
West south central

Study: J-1

Johnson, George E., and Frank P. Stafford
"Social Returns to Quantity and Quality of Schooling"
Journal of Human Resources (1973), vol. 8, no. 2, 139-155.

Source of data:
National survey conducted in early 1965 by the Survey Research Center of the University of Michigan

Level of aggregation of data:
individual

Model:
Study analyzes two models. In the first model, the hourly wage rate is the dependent variable, hypothesized to be a function of years of education, potential experience, quality of schooling (expenditures per pupil), and urban residence. In the second model, years of education is the dependent variable, and the regression equation attempts to determine the degree to which quality (expenditures per pupil) impacts this outcome.

Number of observations and other characteristics:
national probability sample of households: 1,039 family heads (white males) with some income in 1964
(not self-employed)

Type of analysis:
multiple regression

Labor market outputs:
average hourly earnings in 1964—no specific age

Other outputs:
years of education (independent and dependent variable)

Findings:
Earnings potential is influenced by quality of schooling as measured by state annual per pupil expenditures in primary and secondary schools. The estimated coefficient on the school quality variable in the first model is both significantly greater than zero and less than

unity. The authors conclude that this implies that there are positive but diminishing returns to per pupil expenditure on schooling.

The marginal social rates of return to quality of schooling are, in general, much higher than the corresponding rates of return to quantity of schooling. This suggests an underinvestment of educational resources in school quality. The marginal rate diminishes, however, for higher levels of quality.

From the second model, the coefficient on the school quality variable was positive and significant in its impact on years of education. The results show that, on average, a doubling of the expenditure level increases the level of educational attainment by six-tenths of one year.

Other information:

Andrew Kohen criticizes this research: Johnson and Stafford "conclude that quality is significant, but their expenditure/ADA measure is not adjusted for inter-area price level differences" (p. 142).

Data did not include ability measures.

School inputs:

log of average per pupil expenditure per year over 3 decades and by state, adjusted to 1964 prices, weighted according to school level (weights are proportions of total students at each level: elementary and high school)

analysis reported here used expenditures on primary schooling for 3 time periods:

1929-30 (for those over 42 in 1964)

1939-40 (for those 30-42 in 1964)

1949-50 (for those under 30 in 1964)

Pupil inputs:

years of education

years of potential experience (AGE-ED-1)

years of potential experience squared

urban residence in 1964

whether grew up in urban area

father's education (not clear how measured)

# of brothers and sisters

# of older brothers and sisters

age

Peer inputs:

Study: K-1

Kohen, Andrew I.

"Determinants of Early Labor Market Success Among Young Men: Race, Ability, Quantity and Quality of Schooling"

PhD Dissertation, Dept. of Economics, Ohio State University, Columbus, 1973

Source of data:

National Longitudinal Surveys Project of Ohio State University Center for Human Resource Research, administered by the Bureau of the Census for the Office of Manpower Research of the US Dept. of Labor

Level of aggregation of data:

school level data; from a 1968 survey of the most recently attended secondary school of 2 youth cohorts

individual level data; aggregated into 2 groups (black males and white males) from 1966 survey

Model:

Study assesses the impact of mental ability, quantity and quality of schooling, race, and family background on the early labor market success of young men. Model 1 involves the three stages of analysis which follow, and uses an index for the school quality variable. Model 2 is the same as model 1 except that quality is now measured by dollars per ADA.

Stage I: IQ = f (family background + race + health)

Stage II: years of schooling completed= f (family background + race + health + IQ + school quality)

Stage III: labor market success = f (family background + race + health + IQ + school quality + years of schooling)

Number of observations and other characteristics:

approximately 1,321 black and white males from 3,030 schools, ages 18-24 in 1966, out of school but who had completed at least 8 years of schooling

Type of analysis:

multiple regression—separate regressions run for blacks and whites

path analysis of regression results

Labor market outputs:

hourly earnings on current job (1966: ages 18-24, or 1-6 years after high school)

occupational status in 1966 (Duncan index)

unemployment experience during 12 months preceding the survey (1965: ages 17-23, or 0-5 years after high school):

# of weeks

ratio of weeks unemployed to weeks employed

number of unemployment spells

Other outputs:

IQ

years of schooling completed

(both these variables are used as dependent as well as independent variables)

Findings:

School quality, as defined by either the school quality index or dollars/ADA, has no significant effects for blacks or whites on either years of schooling completed or any of the measures of labor market success when family background, health, and IQ are held constant. The sole exception is a negative effect of school quality on occupational status for whites, which is elaborated on only by stating that this outcome does not result from school type.

Family background affects ability and schooling, but has virtually no effect on labor market success measures net of this effect.

Mental ability has a direct independent effect on early labor market success and affects years of schooling completed.

Quantity of schooling is a significant determinant of early labor market success, and is more important for occupational status than for hourly earnings.

School inputs:

SCHOOL QUALITY INDEX:

availability of library facilities:

volumes/enrollment

pupils per full-time teacher

FTE counselors per 100 pupils

annual salary of a beginning teacher with a BA and no experience, adjusted for geographic region

(Construction of index was as follows:

1) information collected on 2500 schools

2) schools' rank ordered on each component

3) normalized ranks were summed to form composite

4) composite scores grouped into normal frequency

SCHOOL QUALITY MEASURE:

district-wide average of annual expenditures per pupil in ADA, adjusted for geographic region (used as an alternative to school facilities index)

Pupil inputs:

race

health (dummy variable)

IQ (from school survey)

years of schooling completed

family background; operationalized using 2 separate variables:

1) # of siblings

2) index of parents' SES, based on average of:

father's education

mother's education

education of oldest older sibling

father's occupation when youth was age 14

availability of reading material in home at age 14

Peer inputs:

Study: L-1

Link, Charles R., and Edward C. Ratledge

"Social Returns to Quantity and Quality of Education: A Further Statement"

Journal of Human Resources (1975), vol. 10, no.1, 78-89.

Source of data:

National Longitudinal Survey of the Labor Force; data gathered in 1968

Level of aggregation of data:

individual

Model:

Study analyzes the impact of ability, quantity and quality of education (using district-wide annual expenditures/student) on earnings. Also estimates the bias caused by the omission of ability. Study seeks to re-estimate the findings of the Johnson and Stafford model.

Number of observations and other characteristics:

national sample of 214 black and 945 white males, ages 16-26, out of school at least 1 year in 1968 with at least 9 years of schooling completed

Type of analysis:

multiple regression

Labor market outputs:

log of annual earnings in 1968 (out of school anywhere from 1 to 10 years)

Other outputs:

Findings:

Quantity (years of schooling completed) has a significant positive effect on the earnings for whites, even when controlling for mental ability. It has no significant effect on the earnings for blacks.

Quality (expenditures) has a significant positive effect for both blacks and whites on earnings, but the impact is substantially greater for blacks.

The estimated elasticity of earnings with respect to expenditures is .1762 and is significant. This is consistent with the findings of Johnson and Stafford, whose analysis gives a range of .15 to .19 for the same coefficient. Authors conclude that their analysis indicates strong but diminishing returns to investments in the quality of education.

Quality of schooling has little impact on the quantity of schooling; the coefficient of quantity changes only from .1036 to .1020 when quality is entered into the regression equation.

IQ has a positive and statistically significant impact on earnings. Omission of IQ does not seriously bias the coefficients of other independent variables.

An urban region does not have a statistically significant impact on annual earnings.

School inputs:

log of district-wide average annual expenditures per student in 1968 in district where respondent attended secondary school

Pupil inputs:

years of schooling completed

potential labor market experience: respondent's age minus their years of education minus 5 (age - ed - 5)

urban residence in 1968

urbanness of area where resided at age 14, measured on a scale from 1 (farm) to 6 (large city)

# of hours worked last year

mental ability (scores obtained from secondary school of respondent and adjusted to account for different tests)

Peer inputs:

Study: M-1

Meyer, Robert, and David Wise

"High School Preparation and Early Labor Force Experience" Chapter 9 in *The Youth Labor Market Problem: Its Nature, Causes, and Consequences*, Richard B. Freeman and David Wise, eds., Chicago, National Bureau of Economic Research, 1982.

Source of data:

National Longitudinal Survey of the High School Class of 1972; study uses 1972 survey and '73, '74, and '76 follow-up surveys.

Level of aggregation of data:

individual

Model:

Study examines the degree to which academic education, vocational training, or work experience during high school affect labor market outcomes—specifically, annual weeks worked and wage rates.

Outcomes are assessed each year data is available from 1972 to 1976.

Number of observations and other characteristics:

white and non-white males who graduated from high school in 1972, some of whom are enrolled in higher education and some of whom are not currently enrolled (from a national sample of 23,000 youth from approximately 1,300 schools).

Type of analysis:

multiple regression

Labor market outputs:

annual weeks worked for each of 4 years following high school graduation (October to October)

wage rates: average hourly earnings for first full week in October for 5 years following high school graduation

Other outputs:

school nonattendance: probability of being in the sample

Findings:

There is a significant relationship between a greater number of hours worked while in high school and more weeks worked per year upon graduation. Those who work more in high school also receive higher hourly wage rates (approximately 5-9% more per hour). Findings result after controlling for race, test scores, and parents' income.

No measure of high school vocational or industrial training (measured by job training in high school) was significantly related to employment or wage rates after graduation.

High test scores are associated with more weeks worked after graduation, but effect diminishes over the following 4 years. High test scores are also positively related to the wage rate. Class rank is positively related to weeks worked after graduation and to the wage rate, after controlling for test scores.

Parents' income has a strong positive effect on wage rates. A $10,000 increase in income is associated with an 8-12% increase in the wage rate.

On-the-job training does not have a significant effect on the wage rate the first two years after high school. By the 5th time period, the effect is positive and significant.

For each of the 4 years analyzed, the unmeasured determinants of college attendance bear a strong positive relationship to the unmeasured determinants of weeks worked. Holding other variables constant, people who choose to go to school after high school would work more if they were in the labor force than those who choose not to go to school after high school.

School inputs:
job training in high school (dummy variable) defined as any specialized training designed to prepare one for immediate employment upon leaving school

Pupil inputs:
rural/urban residence
whether individual lives in West or not
hours worked during high school:
average hours per week in paid or unpaid job
parents' annual income
whether education of mother is < high school
whether education of father is < high school
whether education of mother is > BA
whether education of father is > BA
race: non-white or not
# of dependents
# of Octobers respondent said he was in school
# of months of on-the-job training
work experience in years
whether currently working part-time
high school preparation:
- sum of 6 test scores
- high school class rank—percentile ranking

Peer inputs:
average annual state wage in manufacturing
average annual state unemployment rate

Study: M-2

Morgan, James, and Ismail Sirageldin
"A Note on the Quality Dimension in Education"
Journal of Political Economy (1968), vol. 76, no. 5, 1069-1077.

Source of data:
Date from interviews conducted in 1965 of a national probability sample

Level of aggregation of data:
individual

Model:
Model looks at the difference between actual reported hourly earnings in 1964 and average for the group to which the respondent belongs (based on pupil input variables). This residual is then related to the level of average annual state expenditures on education in the state where each respondent grew up.

Number of observations and other characteristics:
1,525 family heads who earned income in 1964, but did not own a business or farm, with no specified amount of education

Type of analysis:
multiple regression

Labor market outputs:
average hourly earnings in 1964 (any number of years after high school)

Other outputs:

Findings:
$1.00 more per year per pupil spent on education in a state means 24 cents an hour more earned by those who went to school there, all else equal.

State expenditure differences account for 7% of the individual earnings differences.

Other information:
Analysis was extended to include those who attended college but is not included here. Andrew Kohen comments: "Morgan and Siragelden qualify their finding of significance for an expenditure/ADA variable to the extent that they recognize that it may have represented inter-area differences in the level of economic activity" (p. 142).

School inputs:
expenditures per pupil in ADA by state for:
- 1929-30
- 1939-40
- 1949-50

for primary and secondary schools in state in which respondent grew up (used simple average in each of the 3 years, deflated for price changes)

Pupil inputs:
years of school completed
age
gender
race
whether grew up in farming area or not

Peer inputs:
proportion of non-whites in state where respondent now lives

Study: O-1

O'Neill, June
"The Role of Human Capital in Earnings Differences Between Black and White Men"
Journal of Economic Perspectives (1990), vol. 4, no. 4, 25-45.

Source of data:
1980 National Longitudinal Survey of Youth and the 1987 follow-up; verbal and math achievement scores from the Armed Forces Qualifications Test (AFQT), which was administered to this NLSY cohort in 1980

Level of aggregation of data:
individual

Model:
"Do increased school resources actually lead to more of the kind of learning that increases market productivity and earnings?" Study compares the changes in achievement test scores (which the author considers a proxy for school quality) with earnings for both blacks and whites. The author justifies the use of this proxy variable by noting that achievement test scores are correlated with earnings and "presumably the skills that they try to measure are the route by which school resources affect earnings" (p. 32). In addition, the changes over time in black-white differentials in academic achievement as seen in AFQT scores parallel the historical changes in school resources.

Number of observations and other characteristics:
902 black men and 2055 white men, ages 22-29 in 1987, with any number of years of schooling, who worked 35 hours or more per week

Type of analysis:
multiple regression—separate analyses done for blacks and whites

Labor market outputs:
hourly wage in 1987 (4 to 11 years after high school)

Other outputs:

Findings:
Scores on the AFQT show a strong positive correlation with wages, after controlling for years of schooling.

Standard measures of schooling quality, such as student/teacher ratios and percentage of teachers with advanced degrees, have no effect on wages of men in the NLSY sample.

School inputs:
AFQT score, which is a proxy for a measure of school quality
student/teacher ratio
% of teachers with advanced degrees
"other measures of the resources of the youth's high school"

Pupil inputs:
years of schooling as of 1980 (ages 15-22)
years of schooling since 1980
AFQT score in 1980
whether or not currently enrolled in school
potential work experience:
years since age 18 not enrolled in school or military
years worked 26 weeks or more since age 18
years in the armed forces
years worked while enrolled in school
tenure (years) on current job
blue collar occupation (dummy variable)
race
SVP of occupation (years of specific vocational preparation required)

Peer inputs:
dummy variables:
region (Northeast, West, Midwest)
industry (agriculture; mining, construction; manufacturing; trans., utilities; fin, ins, rel. est., bus. serv.; professional services; public admin.; retail; wholesale trade)

Study: P-1

Parnes, Herbert S., and Andrew I. Kohen
"Occupational Information and Labor Market Status: The Case of Young Men"
The Journal of Human Resources (1975), vol. 10, no. 1, 44-55.

Appendix B (cont.): Detailed Summary of Relevant Studies

Source of data:

National Longitudinal Surveys Project of Ohio State University Center for Human Resource Research, administered by the Bureau of the Census for the Office of Manpower Research of the US Dept. of Labor.

Interviews were conducted in 1966 and 1968; this latter year included an occupational information test.

Level of aggregation of data:

individual

school level data for school quality measure

Model:

Study measures the extent of labor market information (the occupational information test score in 1966) as it relates to measures of labor market success two years later (level of occupational assignment and the hourly wage rate).

Model I: occupational information test score = *f* (yrs. of formal education + counselors per 100 students in high school + labor market experience + IQ + family SES + type of residence)

Model II: occupational assignments (1968 Duncan index) = *f* (occupational information test score + yrs. of formal education + labor market experience + IQ + family SES + quality of high school attended + place of residence)

Model III: average hourly earnings (1968) = *f*(occupational information test score + yrs. of formal education + labor market experience + IQ + family SES + quality of high school attended + place of residence + region of residence + health condition)

Number of observations and other characteristics:

approximately 5,000 men (3,500 white; 1,500 black) ages 14-24 in 1966, both in school and not in school in 1966

Type of analysis:

multiple regression—separate regressions for those in school and not in school in 1966 and for whites and blacks

Labor market outputs:

1968 socioeconomic level of occupational assignment (Duncan index; 0-10 years after high school)

average hourly wage rate of those men out of school and employed full time in 1968, ages 16-26 (0-10 years after high school)

1966 occupational information test score (dependent and independent variable; 0-8 years after high school)

Other outputs:

Findings:

Index of school quality does not achieve statistical significance for either black or white youth on hourly earnings or on Duncan index (occupational assignment).

Index of family SES does not achieve statistical significance for either black or white youth on hourly earnings or on Duncan index (occupational assignment).

No relationship found between the extent of vocational counseling and occupational information test scores.

A youth's knowledge about the world of work has a significant positive independent effect on earnings and occupational assignment. Years of education, IQ scores (whites only), and SMSA residence (whites only) all have a significant positive impact on earnings. South has a negative significant impact on earnings for both blacks and whites.

School inputs:

full-time counselors per 100 pupils (this is both an independent variable as well as part of the measure of the school quality index)

SCHOOL QUALITY INDEX:

- per pupil availability of library facilities
- pupils per full-time teacher
- full-time counselors per 100 pupils
- annual salary of beginning teachers, deflated by an index of inter-city relative prices in 1967

Construction of index was as follows:

1) information collected on 2,500 schools

2) schools' rank ordered on each component

3) normalized ranks were summed to form composite

4) composite scores grouped into normal frequency

Pupil inputs:

1966 indices:

scores on occupational information test (0-56)

(this is both a dependent and independent variable)

years of schooling

labor market experience

IQ score (constructed from test scores obtained from high schools)

health condition

region of residence (South or non-South)

place of residence (SMSA or not)

family SES, based on:

- father's education
- mother's education
- education of oldest older sibling
- father's occupation when youth was age 14
- availability of reading material in home at age 14

type of residence:

rural farm
rural non-farm
small city
medium city
suburb
large city

Peer inputs:

Study: R-1

Rumberger, Russell W., and Thomas N. Daymont

"The Economic Value of Academic and Vocational Training Acquired in High School," Chapter 6 in *Youth and the Labor Market: Analyses of the National Longitudinal Survey*, Michael E. Borus, editor. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 1984.

Source of data:
National Longitudinal Survey of Labor Market Experience; uses 1979 interview and 1980 follow-up

Level of aggregation of data:
individual

Model:
Study looks at differences in high school curricula, focusing on individual differences in high school experiences and their effects on opportunities after leaving school. Relates high school training to labor market outcomes, including an assessment based upon whether a student's vocational training was used on the job. Study seeks to answer the questions "Do curricular differences in high school lead to differences in outcomes? What constitutes the best preparation for the future?"

Number of observations and other characteristics:
1,857 respondents from the 1979 cohort, 17-21 years old in 1979. A 1980 follow-up survey was conducted when this group was 18-22 years of age. Sample was restricted to those who were not enrolled full-time during the 1980 interview, who had complete transcript data, and who had completed 9 to 12 years of schooling.

Type of analysis:
multiple regression—separate regressions done for males and females, high school graduates and non-graduates

Labor market outputs:
hourly earnings in 1980 survey week—ages 18-22 (1-7 years out of school)

# of weeks unemployed the previous year (1979; 1-6 years out of school)

# of hours worked the previous year (1979; 1-6 years out of school)

Other outputs:

Findings:
For males:

No significant findings for the earnings outcome. For weeks unemployed, significant negative relationship with greater amounts of coursework in vocational and academic areas. Also a significant negative relationship with a vocational program (defined as a course of study with at least 3 credits in a specific area) and with a program that is later used on the job. For hours worked, significant positive relationship in these same areas, as well as in amount of coursework taken in other areas. A program used on a later job has a greater impact on hours worked than on weeks unemployed.

For females:

Similar findings as for males. In addition, however, females showed a significant positive relationship between increased vocational and academic coursework on earnings as well as a program used on a later job on earnings.

In all cases, a vocational program not used in later work had no significant effect on any of the labor market outputs.

School inputs:
AMOUNT OF COURSEWORK TAKEN

(measured in number of credits)

academic courses:

language arts, foreign languages, math, natural science, social science

vocational courses:

agriculture, distributive education, health, home economics, office, technical, trades and industry courses

other:

all else including business, industrial arts, art, music, physical education

Pupil inputs:
parental education: number of years of school completed by mother or father (whichever is greater)

cultural index: presence or absence of newspapers, magazines, library card at age 14

GPA in 9th grade

race (white, black, Hispanic)

marital status (dummy variable)

# of children living with respondent

children, by gender

post-school experience: # of months between date respondent left school and date of interview

gender

Peer inputs:

Study: W-1

Wachtel, Paul

"The Effect of School Quality on Achievement, Attainment Levels, and Lifetime Earnings"

National Bureau of Economic Research and New York University, 1976

Source of data:

NBER-TH data set, collected in the mid-1950s by Thorndike and Hagen of Columbia Teachers College to study occupational choice. Sample of original respondents was surveyed again in 1968-69 to gather data on education, occupation, and earnings. Questionnaires were sent out in 1970 and 1971 to gather information on family background. This research also uses the 1936-38 Biennial Survey of Education, of the US Office of Education, as well as data from the National Research Council.

Level of aggregation of data:

individual

school level data, used for the measure of school quality

Model:

Study examines the question of whether and how school quality affects labor market outputs, using a recursive model (run with and without school quality measure, defined by expenditures per district):

post HS achievement = *f* (# siblings + mother's ed + father's ed + school quality)

yrs. of schooling = *f* (# siblings + mother's ed + father's ed + age + school quality + test score)

earnings in '69 = *f* (father's ed + yrs. work experience + log of hrs. worked + school quality + test score + yrs of schooling)

Two additional models examine college quality; these findings are not discussed in this summary.

Number of observations and other characteristics:

1,812 male respondents whose mean age in 1969 was 47. Eliminated from the study were pilots, unmarried respondents, those who reported poor health in 1969, or those for whom real (1958) earnings were not between $4,000 and $75,000 in 1955 or between $5,000 and $75,000 in 1969. Includes only those who attended public schools. In 1943, all respondents were in the Army.

Type of analysis:

multiple regression

Labor market outputs:

log of real earnings in 1969, deflated to 1958 dollars (any number of years after high school)

Other outputs:

1943 achievement test scores

total years of schooling

Findings:

Model 1: School quality (expenditures per district) has significant positive impact on post-high school achievement and earnings, but not on years of schooling. This finding could result from respondents with superior pre-college education having a higher earnings potential, or that student stipends under the GI Bill encouraged respondents with inferior pre-college education to go back to school.

There is very little collinearity between school quality and other variables. Therefore school quality affects earnings directly and also has an indirect effect through achievement. "The direct effect of the school quality variables on achievement and earnings is as strong as the effect of most background and intervening variables" (p. 511). The variation in school quality has only a very limited effect on the earnings distribution: 1 s.d. above the mean = only a 6.2% increase. A $1 increase in school quality (in 1937-38 dollars) increases earnings by .18%.

Alternative to Model 1: added a variable for the median state income in which the high school is located, and re-ran equations. Results: for 1969 earnings, the school quality variable is positive and significant, but the median income coefficient is negative; therefore the model accurately captures the effect of school quality in the current expenditures measure.

Regressions using alternative measures of school quality and comparing 1955 earnings to 1969 earnings found that school quality had a smaller proportional effect on earnings in 1955 than in 1969; therefore, there is "evidence that school quality affects the rate of growth of earnings." All of the alternative school quality measures (except teacher/pupil ratio) were positive and significant for the 1969 earnings outcome.

School inputs:

SCHOOL QUALITY

current school expenditures per student in ADA for school district in which respondent attended high school

Appendix B (cont.): Detailed Summary of Relevant Studies

ALTERNATIVE SCHOOL QUALITY MEASURES
FOR DISTRICT (each entered separately)
teacher/pupil ratios
average teacher salary
average enrollment per building
length of school year (in days)
expenditures on texts and other forms of instruction per pupil in ADA
ratio of average teacher salary to state median income
current school expenditures per student in ADA for school district in which respondent attended high school

National Research Council Data:
SCHOOL QUALITY MEASURES FOR DISTRICT:
size of HS graduating class
% of teachers with more than BA
# of PhDs who graduated from high school
as a % of the graduating class

Pupil inputs:
1943 test score
# of siblings
mother's education in years
father's education in years
years of schooling
age in 1969
years of work experience
hours worked per week
total direct expenditures for post-secondary schooling
Gourman score for undergraduate school (a school ranking for the 1,437 who attended college)

Peer inputs:
median income in the state of respondent's high school (from 1940 census)

Study: W-2

Welch, Finis
"Measurement of the Quality of Schooling"
American Economic Review (1966), vol. 56, 379-392.

Source of data:
1954-56 Biennial Survey of Education (used for school system data)
Rural School Survey

Level of aggregation of data:
state level data, aggregated from individual and school data

Model:
Study seeks to identify determinants of the returns to schooling and to isolate the important factors that contribute to quality of schooling. Uses a Cobb-Douglas function, which predicts the return to one unit of school from information on quality of schooling, quantity of schooling, # of persons employed, and quantity of non-labor inputs. Observations are for states.

Number of observations and other characteristics:
rural farm males, at least 25 years of age, who earned income in 1959; college attendees are excluded, but sample is not necessarily confined to high school graduates

Type of analysis:
multiple regression

Labor market outputs:
return to education, defined as the difference between the predicted income of an individual in a particular state who has attended school for x years and the predicted income of someone who has no schooling
This return is a function of the # of units of schooling times the quality of schooling times the value of the marginal product of education.

Other outputs:

Findings:
The effect of teacher salaries is always positive; an increase in salaries would be expected to improve the quality of schooling.
High teacher/pupil ratios are associated with lower quality; the author suggests that this outcome may indicate that smaller schools are somewhat less efficient.
The net effect of expenditures per pupil is hypothesized to be 0, which results from the opposing forces of the salary and teacher-pupil variables which work in opposite directions.

Other information:
This study is criticized by Morgan and Sirageldin for using expenditures on education in the state where the person now resides, as opposed to expenditures in the state where each person grew up, as they did.

School inputs:

QUALITY OF SCHOOLING

1955-56 academic year data for STATE:

expenditure per pupil in school system

instructional staff per 100 pupils

average salary of instructional staff

average # of pupils enrolled in secondary school

Pupil inputs:

years of school completed

age

annual income

race

Peer inputs:

capital variable for the return to farm land and buildings to farm operators

# of persons employed by the state

quantity of non-labor inputs by state

nonwhite states

white states

regional variables:

- East north central
- West north central
- South Atlantic
- East south central
- West south central
- Mountain
- Pacific

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